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Original Articles

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ORIGINAL ARTICLES

SOME PROBLEMS IN GENESIS AND DEVELOPMENT WITH SPECIAL REFERENCE TO THE HUMAN PALATE*

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I FEEL somewhat out of place. I am not a dentist and not an orthodontist. I am an anatomist and have for many years been especially interested in the embryology and morphology of the nose, the hard palate and the related parts; and it is, I take it, to address you from this point of view that I have been invited to appear here.

The title of my paper is misstated in the printed program in that it implies I will cover the whole field of rhinology as related to orthodontia. This obviously is impossible in the limited time at our disposal. I will, therefore, follow the instructions of your committee and present some problems of general interest and importance with special reference to the genesis and formation of the hard palate and certain related structures.

GENERAL CONSIDERATIONS

Usually when one thinks of the genesis and the development of an organ or system, one has primarily in mind the so-called typical—the type which, however, scarcely ever exists in all details and in which, not infrequently, marked departures are encountered.

Secondly, in the origin and the development of a part of the human body—I care not what, although the problem is more acute in some places than in others—we have to do with rudimental and developmental potentials. An appreciation of this concept is of the greatest importance. It is because of these rudimental and developmental potentials, over which one can have little or no control, that orthodontists have much corrective work to do. I am not

*Address at a meeting of the New York Society of Orthodontists, Dec. 12, 1928.

now thinking of the acquired mouth and jaw conditions, the result of faulty food, bad breathing, improper dental care and other improper infantile and childhood practices. The really ideal mouth rarely exists at birth. We have to contend with genetic and developmental potentials, the latter of varied sorts; and these, of course, profoundly affect the definitive form of the several parts. Of course, the definitive form may be profoundly affected by the faulty practices mentioned.

For example, we have to do with rudimental and developmental potentials in the formation of the liver, the formation and position of the transverse colon, the genesis of the pancreas, the morphology of the jaws and the teeth, and the genesis, development and morphology of the accessory sinuses of the nose. Indeed, it was in connection with the accessory sinuses that my attention was first directed to the possibilities underlying the matter of rudimental and developmental potentials.

Mention was made by a previous speaker of the tissues which support the teeth, and the thought was advanced that there is variation in the amount of tissue in different individuals and that frequently the support of the teeth is inadequate. I am in accord with this view. This is a congenital defect or weakness. The concept of constitutional inadequacies has passed the stage of theory. It has been shown, for example in connection with Keyes' work on fragile bones, that in these cases we are dealing with a congenitally defective middle germ layer. This, of course, is a condition over which we have no control, at least, not at the present time. However, this interpretation of the condition will be of value in advising those afflicted. Should the character be inherited, it may become a problem for the geneticist.

The third factor—remember, I said the first had to do with the so-called typical development, the next with rudimental and developmental potentials—has to do with arrests in development. The latter are very common in connection with the soft palate, the hard palate and the lips. I shall later present slides to show that in the development of these parts we have to do with critical periods, and if something happens at such periods, defects may result. If fusion of the mesenchymal bars is interfered with at the critical time, coalescence of the parts may not take place subsequently, leading to the divers types of harelip and cleft palate. These critical periods may last a few days or but a few hours, as has been shown by the work of experimental morphologists.

It is difficult to explain all the developmental arrests. Are the arrests, as some one has suggested, due to an inadequate blood supply? Is trauma a factor? Is the environment faulty? Doubtless, heredity is the determining factor in some instances. I am of the opinion that the matter of injuries should be more seriously taken into consideration. Of course, one may say, How can an embryo or a fetus be injured in the uterus? Mall showed that this may occur in various ways. Also growth processes are not complete at birth. It is, therefore, wrong to think that an infant or a child may fall to the floor from a high chair with impunity and that no thought need be given the matter.

I was much impressed sometime ago in looking over a large series of skulls to note how frequently in those skulls with deflected nasal septa there was obvious injury to the bridge of the nose, seemingly indicating that deflected

septa may be tied up with injuries, falls or blows on the nose, probably at a very early stage, that is, in the formative period of the hard palate, the nose, the septum and the related parts. Who knows but what an imbalance in the growth processes is set up at this time, never to be corrected, and that faulty anatomic conformations in the nose and mouth result.

There is a fourth phase to be considered, and I am of the opinion that we dare not ignore it. The concept is also held by others, Hrdlicka being especially a strong exponent of it. In a recent Smithsonian publication he puts the matter tersely as follows: "It may be stated, and that as an organic law, that every reaction, whether in the direction of more or of less, unless artificially counteracted, leads, if repeated often enough and within the healthy limits, to an organic habit and organic modification. And such habits in the course of time lead, in some way that as yet is not fully understood, to more or less hereditary traits—which are items of evolution or devolution."

We are going ahead, however, seemingly to our disadvantage in some respects. Generally speaking, acquired characteristics are not readily transmitted and inherited, and it is well that it is so in many instances. However, Hrdlicka is of the opinion and appears to have shown that many functional acquirements become fixed and hereditary in families or even in large groups of men. He cites the change in stature of families, the slow but definite change in the form of the head in man during the last thousand years, the refinement of the physiognomy, in which, among other changes, deficiencies in the teeth and in the jaws have become manifest. The concept that the teeth of the more highly civilized white man have become smaller, less resistant and more irregular in varied ways and that all of these changes may have become more or less hereditary is, of course, significant and important, especially so in orthodontia.

After the foregoing we are now in a position to appreciate that growth processes, anatomic contours and relationships and the anatomic types which prevail in the adult body vary and that we cannot expect an unvarying typical form. The potentials are great. These factors are annoying in arriving at a diagnosis; treatment must be modified so as to accord with the morphology; prognosis cannot be constant and the course of disease is not infrequently profoundly influenced.

The accessory nasal sinuses are now treated by the trained rhinologist from the point of view of anatomic types and variations, rather than from the time-worn conception of an unvarying typical anatomy. We now believe that stomachs belong to individuals and that they normally vary in shape and position. The greater curvature of this organ in some individuals is found as low as the pelvis, yet normal function is maintained. These extreme types may not be acquired in the individual but may be inherited. Some are, of course, acquired, the result of some cause or other. It is regrettable that we know so little about the heredity of the arrangement, shape and position of the various parts of the body. Our knowledge of the hereditary features of anatomic variations is limited almost wholly to the external parts of the body.

In some instances it would be very desirable if types could be determined early. It would be an advantage to detect a trait or a tendency. We now be-

lieve that this is possible in some instances and that measures may be instituted to forestall the establishment of bad anatomic conformations and relationships. While it is well established that visceral morphology and topography are subject to individual variation, it would appear that they are more or less closely correlated with bodily type. For example, take large-chested individuals with the ribs more nearly in the horizontal plane, with a capacious upper abdomen and the liver well up under the overhanging costal cage, the so-called hypersthenic type. Then, take the individuals with the narrow thorax, the ribs more in the oblique position, the antero-posterior diameter of the abdomen lessened, the asthenic or slender type. It is the latter type that is predisposed to visceroptosis, or the organs falling out of position. Hypersthenic and asthenic contours are congenital conditions. The visceroptosis may not be present at birth; however, unfortunately, the tendency is there for the condition to become acquired. We now believe that corrective measures may be

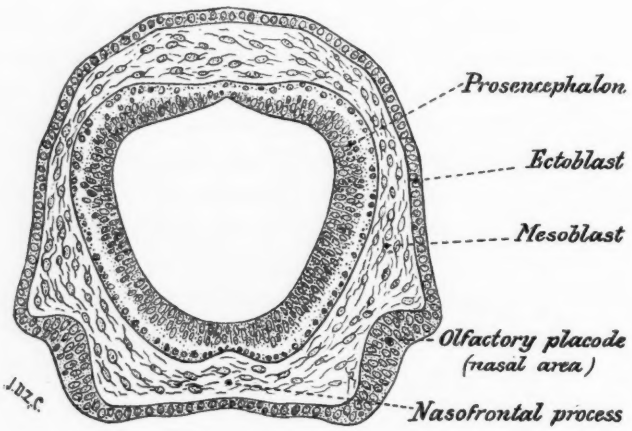

Fig. 1.—Section through the head of a human embryo three weeks old, showing the olfactory placodes or nasal areas.

carried out to prevent in many instances the ptosis of certain abdominal organs. The early detection of the type is of primary importance.

The orthodontist has a similar responsibility in his field. Tendencies should be detected early, and certain appropriate exercises and corrective measures should be instituted to prevent, if possible, the formation of ill-shaped jaws and teeth. The work of the orthodontist, like that of the internist, has to do with prevention as well as with alleviation and correction.

To recapitulate: We have on the ontogenetic side of development, the so-called typical, which seldom exists in all details; the varied development, the result of rudimental potentials; and the developmental arrests, probably occurring at critical periods for the part, these due to varied causes. Heredity may be a factor, and since ontogeny repeats phylogeny we have to contend with our more remote ancestral history as well. Finally, there is the matter which has been stressed by Hrdlicka, that in some way we are slowly producing new types, and this seems to be especially true with reference to the human jaw, the shape of the head and the state of the teeth.

THE EMBRYOLOGY OF THE PALATE AND RELATED PARTS

We are now in a position to apply some of these concepts in the origin and the development of the palate and certain related parts. In order to make clear the early ontogenetic history of the primitive (premaxillary) palate, it is necessary to make reference to the embryology of the early nose.

THE EARLY NOSE

The nose and its accessory parts have their origin in a pair of convex areas of the cranial ectoderm near the location of the closed anterior neuropore. These thickened epithelial areas or olfactory placodes are recognizable

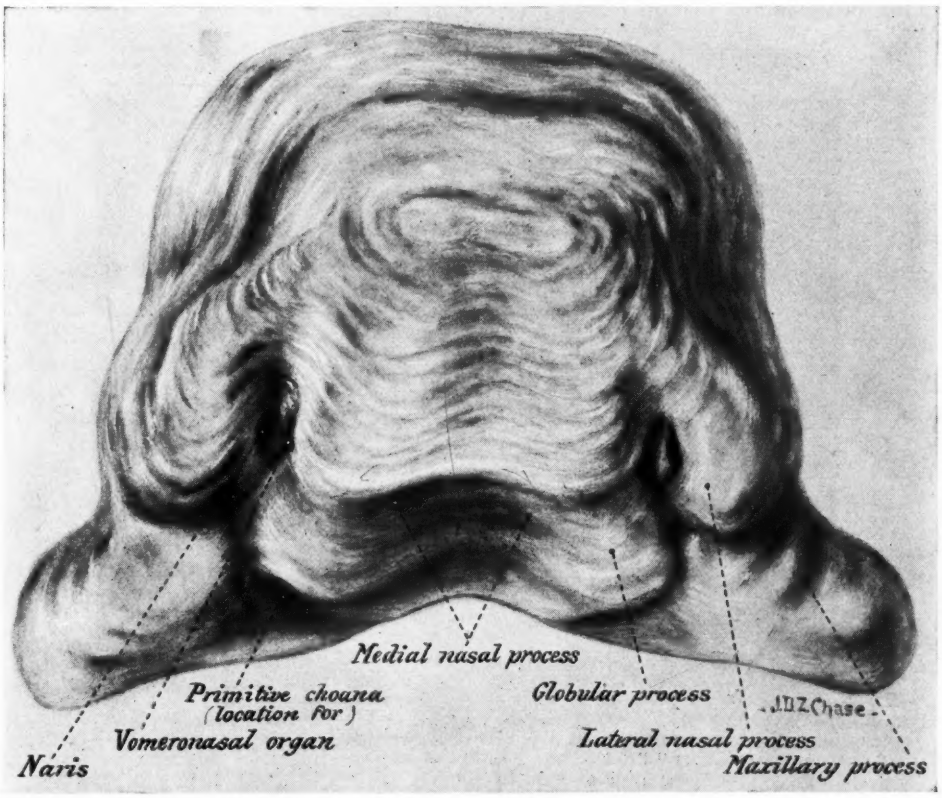

Fig. 2.—Drawing of a reconstruction by the author of the face region of a human embryo thirty-five days old, illustrating the several embryologic processes and their fusion in the formation of the early nasal pits or fossae.

as early as the third week of embryonal life and are located immediately above the primitive oral fossa on the external surface of the wall of the forebrain (Figure 1). During the fourth week the areas become depressed by an increase in the thickness of the surrounding mesoderm, which pushes the margins of the overlying ectodermal placodes into relief. In this manner each placode becomes surrounded by a fold. The depressed nasal areas become the early nasal pits and are separated by a broad bar of tissue, the frontonasal process. The pits deepen and separate the caudal portion of the frontonasal process into medial and lateral parts (Figure 2). These are the rudiments of the medial and lateral nasal processes. During the fourth or fifth week the

median portion of the frontonasal process undergoes further differentiation into the mesial or unpaired part and two lateral or paired parts. The paired parts are in reality the medial nasal processes, and they form the medial boundaries of the nasal pits. The lateral portions of the frontonasal projection form the lateral nasal processes, the immediate lateral boundaries of the nasal pits. The maxillary processes of the first or mandibular arches grow ventralward and medialward, abut and later fuse with the medial nasal processes (Figures 2 and 3).*

The fusion of the parts takes place from within outward, and this leads to a separation of the primitive oral cavity from the early nasal pits. The union of the maxillary processes with the medial nasal processes forms the primitive inferior boundaries of the nasal pits. Subsequently, the growth of the lateral

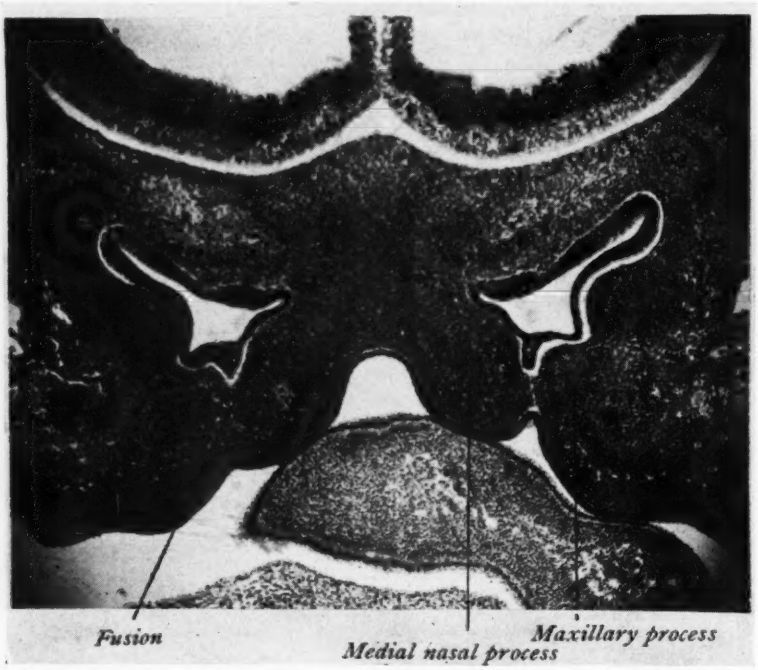

Fig. 3.—Photomicrograph of a frontal section of the head of a human embryo thirty-five days old. Note that the plane of section is through the forward portion of the primitive nasal fossae and that the mesenchymal maxillary and medial nasal processes have fused. The epithelium covering the processes has disappeared, and the mesenchymal cells of the two have intermingled. Compare with Fig. 4.

nasal processes medialward and ventralward above the maxillary processes leads to a coalescence of the latter with the medial nasal processes, thereby forming the immediate inferior boundary of the early nasal pits. Laterally, fusion also takes place between the maxillary and the lateral nasal processes in the obliteration of the naso-optic furrow.

For a brief time only, strands of ectodermal tissue are wedged between the abutting maxillary, the lateral nasal and the medial nasal processes (Figures 3 and 4). The ectodermal plates disappear, and the mesenchyma of one

*Figures 1, 2, 7, 12, 13, 14, 17 are from J. Parsons Schaeffer, *The Nose, Paranasal Sinuses, Nasolacrimal Passage-ways and Olfactory Organ in Man,* and are reproduced through the courtesy of P. Blakiston's Son & Co., Philadelphia.

process becomes continuous with that of the other. Farther dorsally the ectodermal tissue between the abutting processes does not wholly disappear for some time. It, however, becomes thin and attenuated and superimposed upon the oral epithelium in the formation of the bucconasal membranes (Figure 5). The early nasal fossae are, therefore, represented for a time by two blindly-ending epithelial pouches lying side by side in the mesenchymal tissue just above the oral cavity (Figure 6). The pouches or fossae communicate freely with the exterior by means of the nares, but in the absence of the primitive choanae at this time the pouches end blindly at their deep extremity. The forward portion of the frontonasal process is thick, and the early nasal fossae are widely separated (Figure 2).

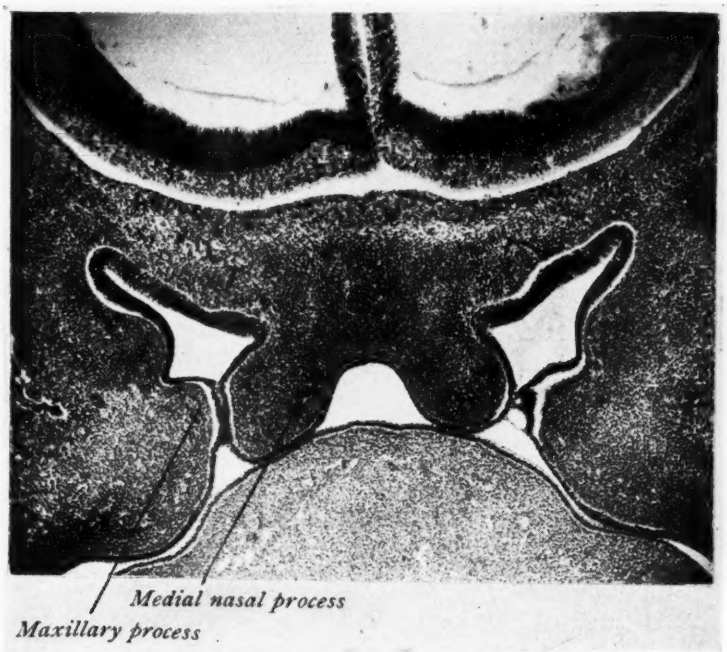

Fig. 4.—Photomicrograph of a frontal section of the head of a human embryo thirty-five days old, through the early nasal fossae. The section is farther dorsal than that shown in Fig. 3. Note that the epithelial-covered maxillary and medial nasal processes are in contact with each other but that the epithelium still intervenes between the mesenchymal bars.

THE PRIMITIVE PALATE

In thirty-five-day embryos, the bucconasal membranes, composed of two layers of abutting epithelium, nasal and oral, become so attenuated and thinned that rupture or disintegration ensues and simultaneously the primitive choanae (primitive posterior nares) are established. These apertures lead to a communication between the early nasal fossae and the primitive mouth cavity, the two openings being located in the roof of the mouth well in advance of the buccal pituitary outgrowth and separated one from the other by the primitive or primary nasal septum (Figure 7).

The metamorphosis of the epithelial olfactory placodes into the sac-like olfactory pouches, the growth of them into the mesenchymal frontonasal process, the fusion of the maxillary and the lateral nasal processes with the medial

nasal processes and the rupture of the bucconasal membranes, in the establishment of the primitive choanae or primitive posterior nares, delimit or outline for the first time the primitive or primary (premaxillary) hard palate (Figure 7). The latter presents facial and oral portions, the facial giving rise to the upper lip and the oral to the premaxillary palate. It appears established that the mesoderm of both the facial and the oral portions is a derivative from the maxillary and the medial nasal processes, the lateral nasal process participating only at the caudal border of the naris; that is, the middle portion of the primitive palate is derived from the mesial nasal process, the dorsolateral portion from the maxillary process, and the ventrolateral portion from the lateral nasal process.

If for some reason fusion of the several elements does not occur at the critical period, further growth, stresses and strains lead to a separation of the

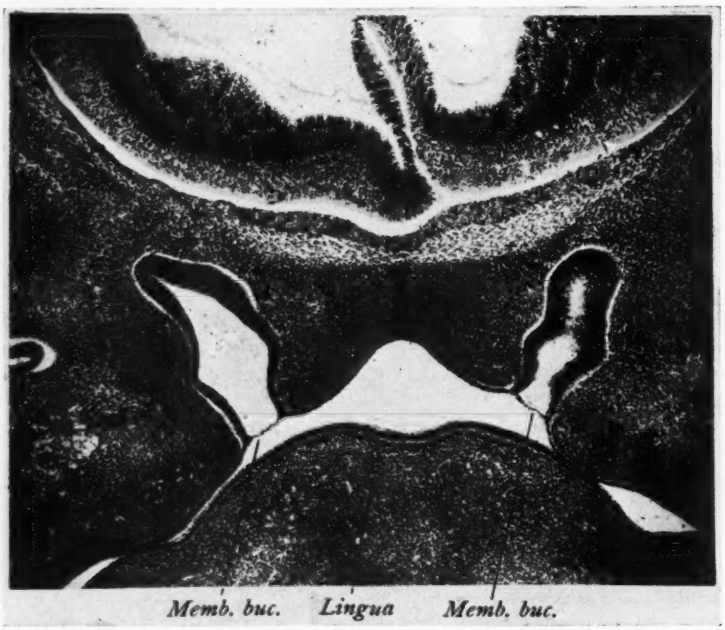

Fig. 5.—Section of the primitive nasal fossae near their dorsal end, embryo thirty-five days old. The photomicrograph clearly shows that the nasal fossae have grown dorsalward and oralward sufficiently far so that the nasal epithelium has come in contact with the oral epithelium in the formation of the bucconasal membranes (memb. buc.). It is these membranes which suffer rupture and absorption in the formation of the primitive choanae, located in the forward portion of the roof of the mouth.

parts; and once a breach in their contiguity is established, union cannot take place subsequently. Lack of fusion and separation of the several mesenchymal processes lead to the malformations or arrests in development known as anterior cleft palate and harelip. The potentialities are such that divers types and degrees of these malformations occur, both unilaterally and bilaterally.

In this connection one must clearly keep in mind that cleft palate is due not to a failure of osseous centers to coalesce but to the nonunion of preosseous mesenchymal bars or processes. It is also important to note that the rudiment of the lateral incisor tooth is formed near the field of fusion of the medial nasal and the maxillary processes, and in the event that the coalescence fails of consummation the lateral incisor rudiment may be carried away by either

the maxillary or the premaxillary elements in their further and subsequent separation incident to growth and stresses, or the tooth may be stranded in the gap between them. This accounts for the variability in the location of the lateral incisor in cleft palate (in the maxilla proper, in the premaxilla or between them). It should also be noted that occasionally the palatal portion of the premaxilla is made up of two processes in the preosseous stage, one corresponding to the medial incisor rudiment and the other to the lateral incisor. This apparently explains some of the clefts between the medial and the lateral incisors.

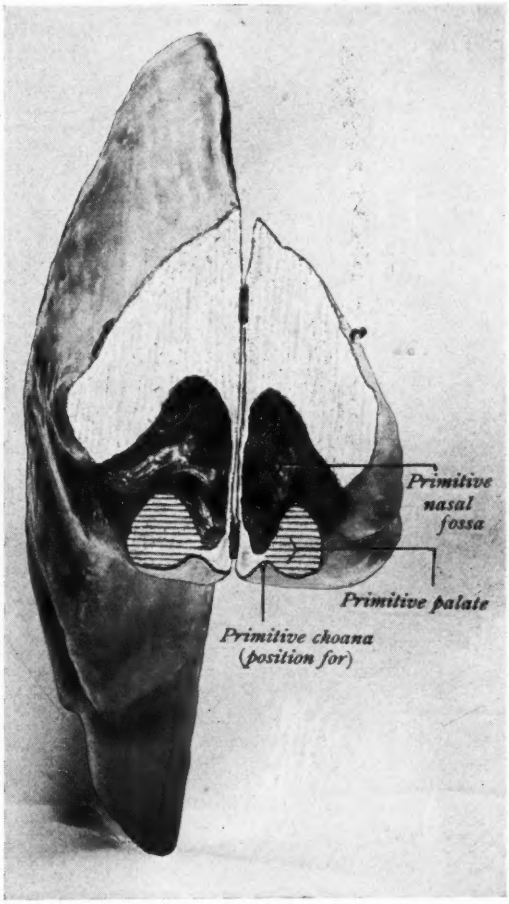

Fig. 6.—Drawing of a reconstruction by the author, showing the left primitive nasal fossa in an embryo (human) about thirty-five days old. Note the primitive palate, in section, and the position for the left primitive choana.

THE SECONDARY PALATE

The secondary (maxillary) portion of the hard palate is formed by the palatal plates of the maxillary processes. The anlagen of these plates appear bilaterally as mere ridges dorsal to the primitive palate, the rudiments being demonstrable as early as the forty-fifth day of embryonic life. At first the palatal plates are directed in the vertical plane toward the mouth cavity (Figures 8, 9, 10) on either side of the tongue. They extend from the point of fusion between the medial nasal and the maxillary processes, where they are

continuous with the primitive palate, posterior to the wall of the pharynx, where they become continuous with the palatopharyngeal folds.

The palatal plates delimit the lateral walls of the nasal cavity below, in anticipation of the separation of the nasal fossae from the oral cavity. For a brief time the tongue normally lies between the right and the left palatal processes, and while in this position the now vertically directed palatal proc-

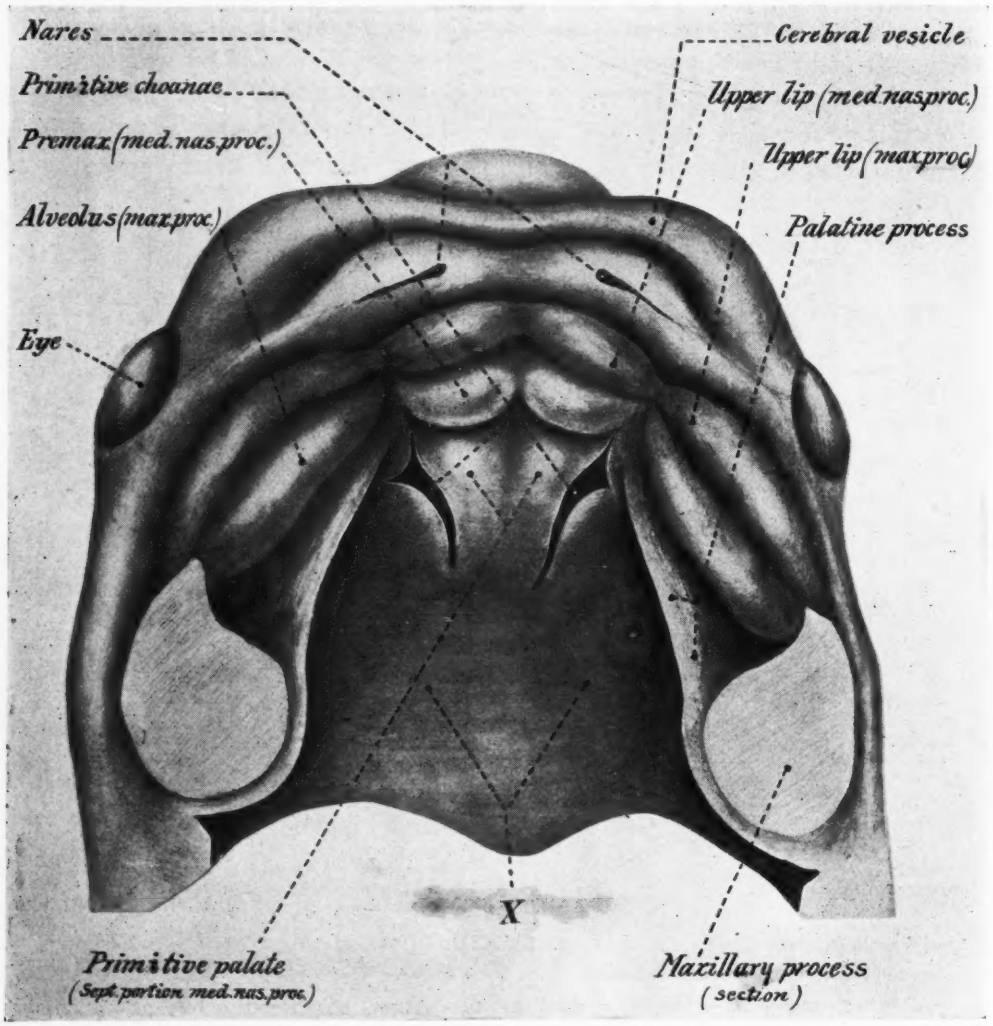

Fig. 7.—Reconstruction of the face and palate regions of a human embryo at the beginning of the second month. Especially note the primitive palate, the primitive choanae in the roof of the mouth and the early palatine processes, which are beginning to grow toward the midline in anticipation of the formation of the secondary palate. *X*, dorsally, the roof of the pharynx and ventrally, the roof of the mouth cavity.

esses cannot swing into the definitive horizontal position or continue their growth toward the midline over the tongue. Indeed, one wonders whether too long a sojourn of the tongue between the palatal processes is not a cause of some of the clefts encountered later in the secondary portion of the hard palate. It is conceivable that the tongue might remain in its interpalatal position just long enough to catch the growing processes at a critical period.

Under normal conditions, however, the tongue sinks at the appropriate time, leaves its interpalatal location and comes to occupy a lower position in the mouth cavity (Figure 11). With this the right and the left palatal processes rotate and assume the horizontal shelf-like plane. By continued growth they fuse with the dorsal border of the premaxillary palate (Figures 12, 13, 14), save where the nasopalatine canals are established and in the midsagittal

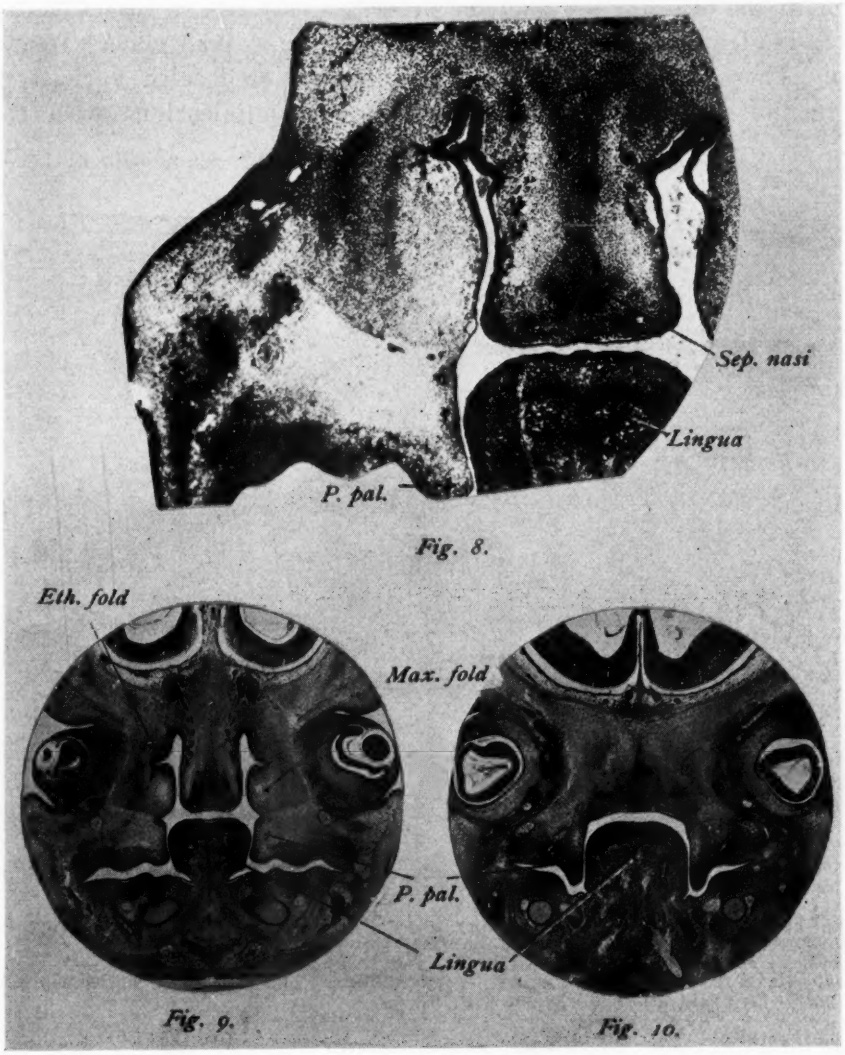

Fig. 8.—Especially note the vertically directed left palatine process (P. pal.) and that the tongue still occupies an interpalatal position. Human embryo forty-five days old.

Figs. 9 and 10.—The interpalatal position of the tongue is well illustrated in these photomicrographs of frontal sections of the head of an embryo (human) forty-three days old. In Fig. 10 the palatine processes (P. pal.) hang vertically, a feature less marked in the palatal processes in Fig. 9.

line with each other. Fusion of the two lateral halves spreads from before backward, and before the end of the third month of intrauterine life it is complete.

In the anterior and more restricted part of the secondary palate the oral border of the primitive nasal septum is wedged between and fuses with the

medially directed palatal plates of the maxillae (Figure 16). Contrary to this, elsewhere the palatal plates normally meet and fuse with each other in the midline under the oralward-growing secondary nasal septum, with which the completed secondary palate also coalesces (Figure 17). Sometimes, however, the secondary nasal septum appears to grow more rapidly and widely, and instead of uniting in the midline with the nasal side of the fused palatine processes it comes to occupy a position between the growing palatine processes. Also one or the other of the palatine processes may fail to fuse with its fellow owing to inadequate growth, yet fusion of one may take place with the nasal septum. These developmental errors are associated with various types of clefts in the secondary palate and faulty communications with the nasal fossae.

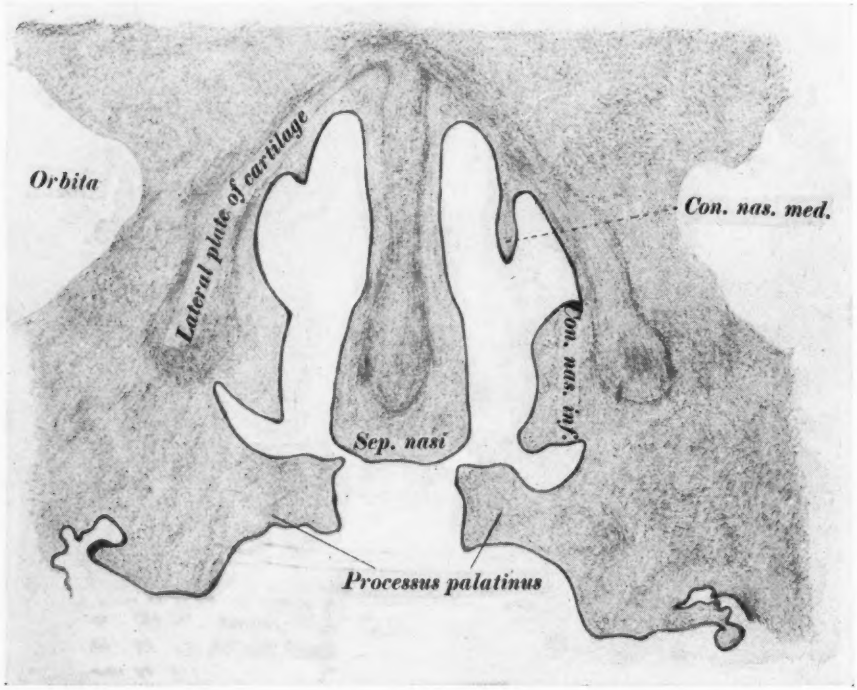

Fig. 11.—Frontal section through the nasal fossae of a human embryo forty-nine days old. The development of the secondary palate is proceeding along normal lines. The palatine processes have assumed the horizontal plane, and it would appear that, had the embryo lived, they would have fused with each other in the midline. The secondary nasal septum is nearing the palate in anticipation of fusion with it.

The horizontal palatine processes are prolonged backward toward and into the pharynx to form the soft palate and the uvula. Later bone forms within the membranous palatine processes, forming the definitive secondary portion of the hard palate. Into the soft palate portions and uvula portions of the palatine processes spread derivatives of the superior constrictor to form the azygos uvulae, the palatoglossus and the palatopharyngeus muscles.

Partial or complete failure of fusion of the lateral halves of the secondary palate leads to the condition of posterior (usually median) cleft palate and a divided uvula. Should one palatine process fail to grow to the midline and the other reach it and fuse with the nasal septum, a naso-oral cleft would be

brought into being on one side only. A cleft in the secondary palate is frequently associated with unilateral and bilateral clefts in the primitive palate and with harelip. However, the defect may exist in the secondary palate alone. This is also true for the premaxillary clefts.

THE DEFINITIVE CHOANAE

Coincident with the growth of the face the primitive or intermaxillary palate increases in its antero-posterior diameter, that is, it is added to in front, its posterior margin remaining relatively fixed. Only a small portion of the primitive palate is so located as to participate in forming the adult palate proper. In the fusion of the palatine processes with each other a small portion of the mouth cavity is thrown on the nasal side of the palate to become perma-

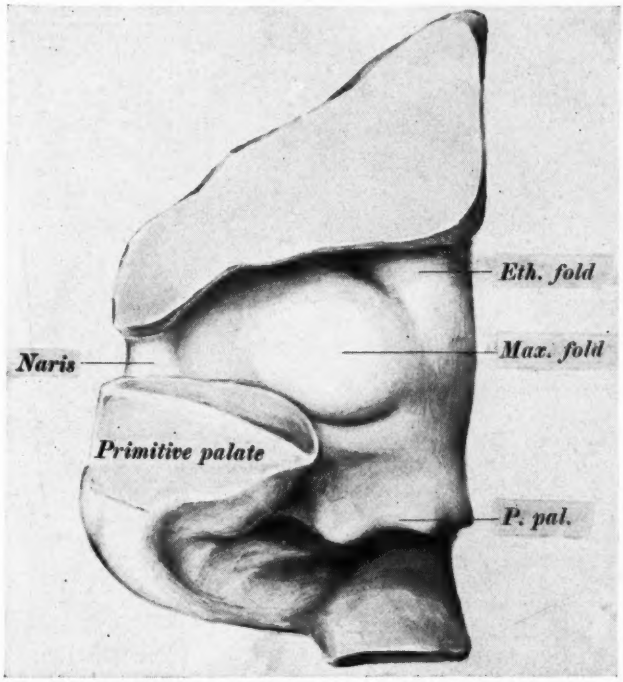

Fig. 12.—A reconstruction by the author of the lateral wall of the nasal fossa and the palate of an embryo (human) forty-three days old. Especially note the primitive palate and the early, vertically directed palatine process (P. pal.). The nasal fossa and the mouth are in wide communication.

nently a portion of the nasal cavity. Fusion of the secondary nasal septum with the midpalate union separates the nasal cavity into the right and left nasal fossae.

Simultaneously with these changes the posterior edges of the primitive posterior nares suffer resorption and recede due to the dorsal growth of the nasal fossae. In a sense, the primitive posterior nares migrate posteriorly; however, more strictly, there is an antero-posterior elongation of the apertures. With the coming together of the palatal processes in the formation of the secondary palate and the fusion with the latter of the secondary nasal septum, the posterior outlets of the nasal fossae are no longer located in the roof of the mouth but come to occupy a position between the migrated dorsal edge of the

primitive choanae above and the dorsal end of the hard palate below, the definitive choanae (posterior nares) now communicating with the nasal portion of the pharynx (Figure 18).

THE PALATE AND THE NASAL SEPTUM

The relationship between the degree of arching of the definitive palate and the deflection or asymmetry of the nasal septum is ever a live problem. During fetal life, in infancy and in early childhood, the septum is usually symmetrical. However, the writer has seen asymmetrical nasal septa in the childhood period and marked cases of deviation in fetuses. Notwithstanding

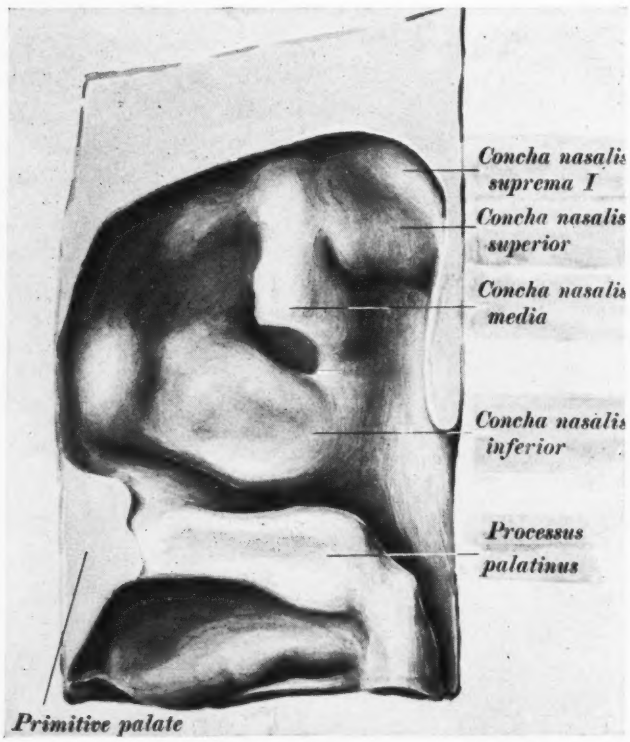

Fig. 13.—A reconstruction of the lateral nasal wall and the palate of an embryo (human) forty-nine days old. Not all of the primitive palate is shown. Especially note that the palatine process has now assumed the horizontal plane and has grown nearly to the midsagittal plane. However, there still is a narrow, long antero-posterior cleft connecting the nasal and mouth cavities.

these exceptions, asymmetries of the nasal septum usually appear after the childhood period, the majority of adults presenting asymmetries varying from slight irregularities to deviations which completely occlude one or the other nasal fossa.

No hypothesis yet formulated seems to explain adequately the asymmetry and deflection of the nasal septum in all individuals. The same course cannot be operative in all cases. Traumatism, often remote and trivial, is doubtless a frequent cause. In a recent examination of a series of skulls, the writer was impressed with the frequency of the coexistence of a deflection of the nasal septum and a previous trauma to the bridge of the nose. Indeed, injuries to

the nose may be so remote and trivial, say during birth or early infancy, that no marks remain, yet growth processes may have been unbalanced thereby.

It is frequently stated that nontraumatic septal deformity is largely a product of ultracivilization and that it is unknown among animals and savages and rare in all semi-civilized races. In this connection it may be of interest to mention that the skull in man, as in all mammals, consists of two parts: the facial part carrying the teeth and developed according to their size, and the brain capsule which develops in accord with the size of the brain. The larger the brain, the smaller the face and the less does the face project in front of

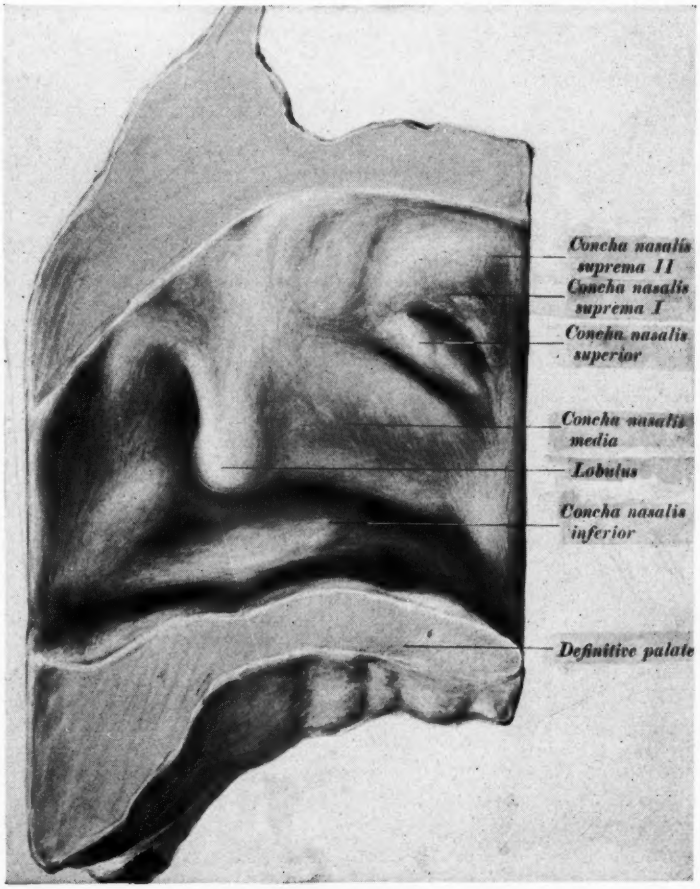

Fig. 14.—In this reconstruction of a specimen of a 105 day old embryo, the secondary palate is complete, fusion having taken place in the midline. The nasal fossa now communicates with the nasopharynx. After a model by the author.

the skull; and, on the contrary, a small brain means a larger face and a greater facial projection in front of the skull.

The degree of the facial projection from the axis of the skull is spoken of as the *facial angle*, which is to a certain degree an index of brain development (Figure 19*A*). The facial angle is smallest in the ultracivilized races of man, considerably larger in the lower races and larger still in the anthropoids. This means that the *angle of flexion* of the cranial axis (basion to nasion line) is greatest in the highly civilized races and lessens as one passes from the lower races to the anthropoids (Figure 19*B*). Moreover, the nasal septum is seemingly

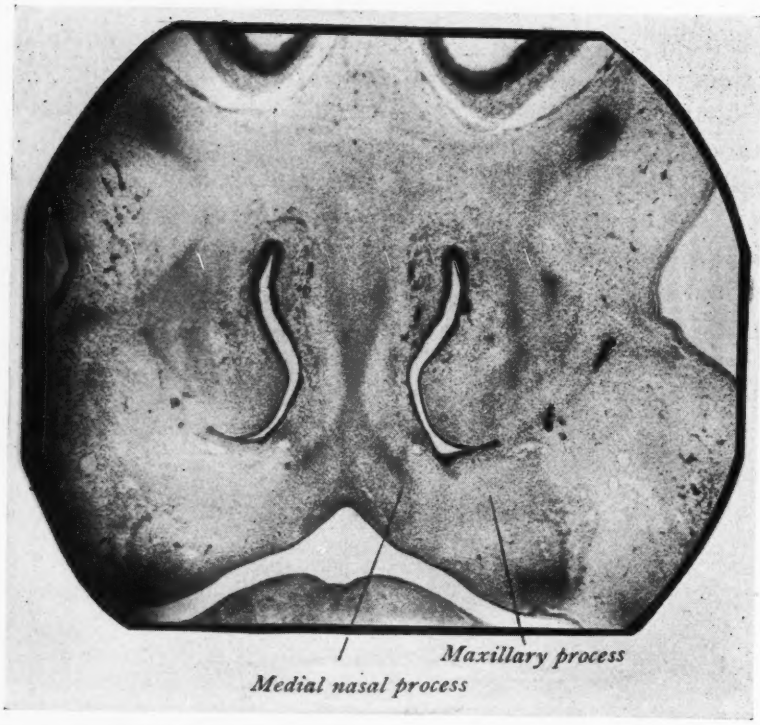

Fig. 15.—Photomicrograph of a frontal section of the early nasal fossa and palate. Here the maxillary and medial nasal processes have fused; the primitive palate is established, and the primitive nasal septum separates the nasal fossae. Human embryo about forty-three days old.

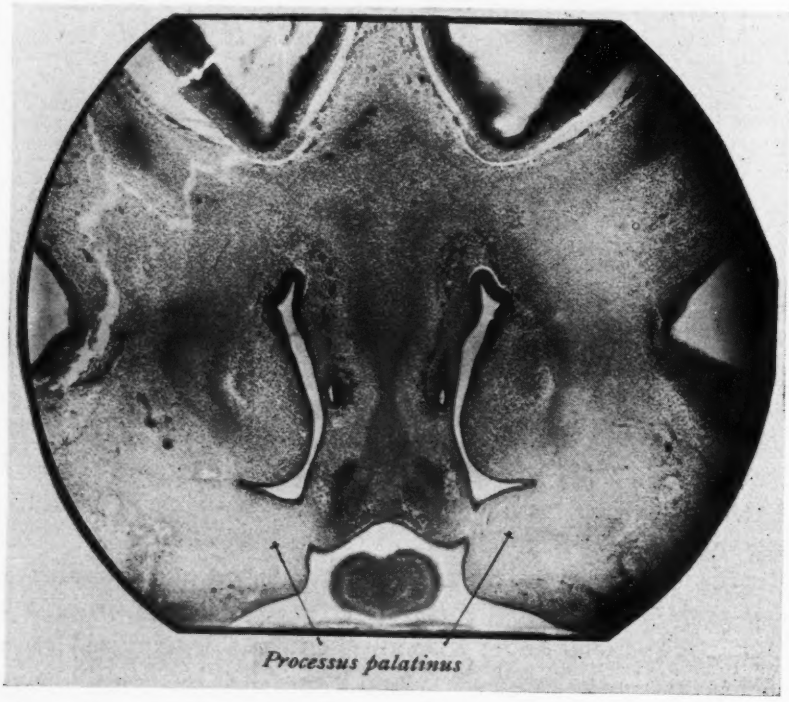

Fig. 16.—In the forward portion of the palatine processes the nasal septum comes to occupy a position between them, fusing with their medial margins. Human embryo forty-four days old.

encroached upon more and more by the forward cranial extension incident to brain growth as one passes from the anthropoids to the ultracivilized races of man. The problem, of course, is whether or not there is a balanced adjustment of all parts of the cranium and face in this evolution. If there is, the gradual alteration of the facial angle cannot be a factor in septal asymmetry. On the other hand, if all parts do not develop in accord with the changes incident to the lessening of the facial angle, one readily sees that the fixed position of the nasal septum might be encroached upon and the septum correspondingly deformed.

In studying the nasal septum one is impressed with its anatomic situation. Located as it is between the unyielding frontal and ethmoid bones above and

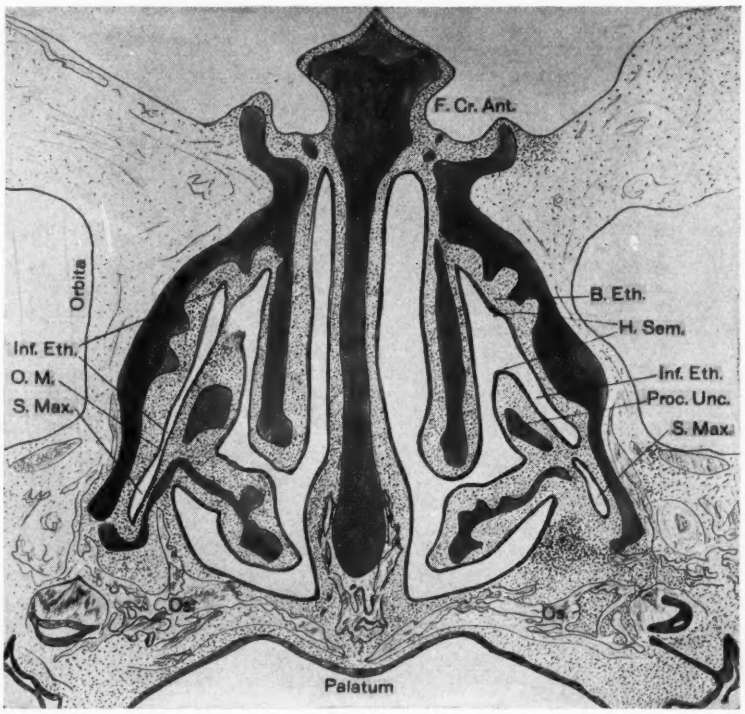

Fig. 17.—The secondary palate is complete, and the secondary nasal septum has fused with it. Note that ossification is well advanced in the maxillae, the palatine processes and the lower end of the nasal septum. Embryo 120 days old.

the sphenoid bone behind and the hard palate below, the septum is essentially fixed in position. Any increase in its cephalocaudal (vertical) diameter must necessarily lead to a buckling of the septum as a whole or to a deviation of one of its component elements. It is not clear what would cause the septum to outgrow the region set for it. Possibly a remote and slight trauma may have altered the balanced growth and in consequence caused one or other of the septal elements to outgrow its region. The vomer, especially, seems to be at fault, owing to increased development in the vertical plane. Ossification along the line of union between the mesethmoid and the vomer is often excessive and doubtless is an important factor in the deviation of the septum in its ventral two-thirds. Should the cranial and facial bones grow at the expense of the

nasal septum, the reverse condition would prevail, namely, a deviated septum owing to encroachment upon its area.

Great importance is given by some to a high or Gothic arching of the hard palate as a causative factor of nasal septum deflection. When one recalls the fixed position of the septum between the hard palate below and the base of the skull above, one would think that anything which lessens this interval (as in high arching of the palate) would encroach upon the elements of the nasal

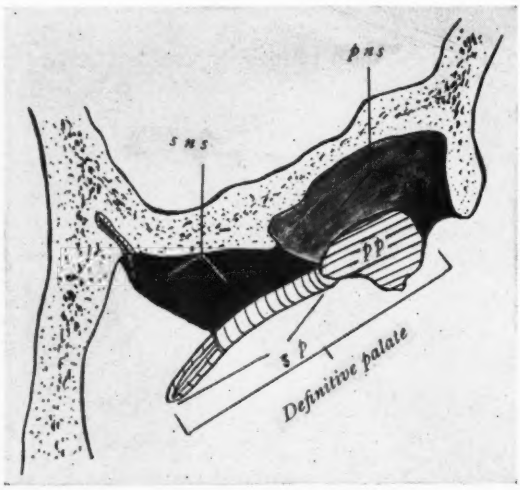

Fig. 18.—A diagrammatic representation of the nose and palate showing the primitive and secondary portions of the nasal septum and the primitive and secondary portions of the palate. The primitive nasal septum, shown in light wash, also indicates the extent of the primitive nasal fossa. The definitive or final palate is, of course, formed by its combined primitive and secondary portions. *Sp,* secondary palate; *pp,* primitive palate; *sns,* secondary nasal septum; *pns,* primitive nasal septum.

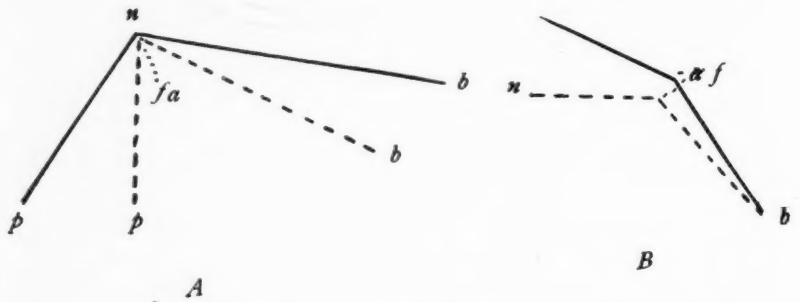

Fig. 19.—In *A* the facial angle of man (broken lines) is compared with the facial angle of the chimpanzee (solid lines). Note the lessened angle in man, the result of greater brain development. In *B* the angle of flexion is shown for man (broken lines) and for an anthropoid (solid lines). Note the greater angle of flexion for man. See text. (*p,* prosthion; *n,* nasion; *b,* basion; *fa,* facial angle; *af,* angle of flexion.)

septum and cause the latter to buckle. However, when one finds markedly deviated nasal septa in extremely flat palatal arches, one questions the Gothic arch theory as a constant factor (Figure 20).

Heredity has also been advanced. Rickets and septal asymmetry may coexist. Septal asymmetry, high arched palate and nasopharyngeal obstruction also appear to have an interrelation.

CONCLUDING REMARKS

It would appear that for the normal development of a structure it is desirable that the true relations of parts be maintained. Developmental processes proceed hand in hand, and the stage of differentiation of one structure is more or less dependent on the well-being of a related part. For example, the germs of the teeth, the maxillary sinus, the thickness of the alveolus, etc., will be found to be in accord with the age of the infant, that is, the parts develop *para passu*. In other words, one part does not force the other to be what it is but needs its relationship for a balanced growth.

I believe that the reckless extraction of deciduous teeth is wrong, since it is apt to bring about an unbalanced state in the growth of parts. It may be a factor in ill-erupted and ill-formed permanent teeth and deformed jaws.

Fig. 20.—Note that despite a relatively low arching of the hard palate there is marked deviation of the nasal septum. A photograph of a frontal section of the head of an adult.

Parents, physicians and dentists are often more or less to blame for the too early disposal of the milk set of teeth. They are too frequently believed to be of little account. I do not know whether I am right or not, but from a developmental standpoint I believe that they should be held in the jaw just as long as possible and that they should have as much dental care as do the teeth of the permanent set. If I am wrong, set me right. However, I cannot help but feel that all milk teeth should remain in the jaw and in relation with the other structures until the time comes when nature has intended that the permanent teeth should replace them. Anyway, when a milk tooth comes away regularly, it is merely a shell, the remaining portion having suffered resorption. The tooth appears to have served as a growth balance up to the very end of its existence.

We have considered some of the genetic and developmental problems which confront the orthodontist in connection with his work. The question naturally arises, Can anything be done to prevent some of the conditions which are so commonly encountered? I feel convinced that we must pay more attention to the early childhood period and detect tendencies early and do something, if possible, to counteract them, thus preventing the development of bad types. The problem as I see it is twofold, preventive and corrective.

A PROGRESS REPORT OF AN INVESTIGATION OF APICAL ROOT RESORPTION OF VITAL PERMANENT TEETH*

By Albert H. Ketcham, D.D.S., Denver, Colo.

A PRELIMINARY report of this investigation was read before the first International Orthodontic Congress in New York City, August, 1926,[1] and also before the Section of Orthodontia at the Seventh International Dental Congress, Philadelphia, Pa., August 25, 1926.[2] In order to recall to your minds the essential points made at that time, I shall review them briefly before taking up the findings in my further research. This preliminary report was based upon the findings in a roentgenographic survey of three hundred and eighty-five treated orthodontic cases from my own practice.

It was pointed out that it is impossible to reach definite conclusions in regard to the relation of root resorption to orthodontic treatment. In fact it was shown that short rooted teeth may be normal for some people. These anatomic variations have been found in tall, well proportioned persons, as well as in those of shorter stature.

It was further demonstrated that resorption of the roots of permanent teeth with vital pulps occurs also in cases where there has been no orthodontic treatment. It has been observed that a root may be resorbed which is adjacent to, or in the path of, an erupting or impacted tooth.

Under the classification of resorption during orthodontic treatment, roentgenograms of several typical cases in various stages of apical root resorption were shown. In some of these the roentgenographic evidence was to the effect that resorption was just beginning; in others, made later of the same cases, the progressive loss of the roots was similarly demonstrated.

One case was shown of a young man twenty years old in which the maxillary incisor roots showed roentgenographic evidence of resorption before orthodontic tooth movement was started, and after two years of treatment evidence of a similar nature showed that the apical half of the roots had been resorbed. This emphasized the importance of correct interpretation of the roentgenograms, before, during and after orthodontic treatment.

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*Lecture given at the twenty-sixth Annual Meeting of American Society of Orthodontists, Chicago, Illinois, May, 1927; and at Annual Meeting of the Pacific Coast Society of Orthodontists, San Francisco, California, February, 1928.

The investigation indicated further that resorption of the roots of the maxillary incisors is much more frequent than resorption of the roots of other teeth.

The vitality of dental pulps in teeth having resorbed roots was studied. In several instances records of such teeth have been kept for a period of years, and apparently the pulps in these teeth had not degenerated, nor had the function of the teeth themselves been impaired.

An analysis of the relation of types of appliances to the incidence and extent of resorption in the 385 cases, reported in the roentgenographic survey, showed that these conditions occurred much more frequently with the type of appliances known as the pin and tube and ribbon-bracket. Even the plain labial arch or the lingual appliance was not entirely free from this criticism.

In summarizing the first report, emphasis is to be laid upon the fact that definite root resorptions were found to have taken place in 21 per cent of cases during or following orthodontic treatment. Sometimes these resorptions occur even in spite of painstaking care to eliminate factors which are supposed to be detrimental to the tissues involved. When one considers this carefully, the conclusion will be reached that there is some other factor in etiology besides the appliances. Is there not an underlying cause or a hitherto unrecognized susceptibility to pathologic effects from mechanical stimuli?

It is also suggested that the extreme variation in development of bone surrounding the roots of the teeth may be mirrored in the pathologic reaction which the roots themselves present to the different degrees or kinds of orthodontic stress. In other words too little account is taken of the degree of bone development when choosing a method of tooth movement, but further investigation may throw some light upon the rate of tooth movement which may be expected from certain types of appliances when used in persons showing either retarded or accelerated bone growth.

Attention is called to the investigation of periods of retarded and accelerated bone growth in children, conducted by Dr. Clinton C. Howard.[3]

After studying the works of Drs. John Albert Marshall, E. V. McCollum, Percy Howe, L. B. Mendell and others, also after considering the poorly balanced diet of the majority of children, do we not have an insight into the underlying causes of many dental ills, including resorptions of tooth roots? Is there a lack of the proper proportion of the essential vitamines and minerals in the diet?

The orthodontist must consider not only the susceptibility of the patient, but also the degree of immobility imparted to the teeth by the appliance. To what degree does the appliance, through immobilization, interfere with the normal function of the teeth, and how long does this interference continue?

FURTHER INVESTIGATION

A roentgenographic analysis of 115 additional treated orthodontic cases from my practice, plus the 385 cases previously reported making a total of 500, is given in Charts 1 and 2.

This roentgenographic survey of 500 treated orthodontic patients shows that definite root resorptions occurred at the apical portion in anterior teeth of 98 patients, or 19 per cent.

RESORPTIONS—MAXILLARY VS. MANDIBULAR

Resorptions in relation to the maxillary and mandibular teeth of these patients were distributed as follows: 31 patients had resorptions of some of the apical root ends of teeth in both maxillary and mandibular dental arches; 65 had resorptions of the apical root ends of some of the maxillary teeth, with

CHART SHOWING
NUMBER OF PATIENTS
TREATED WITH IDENTICAL TYPES OF APPLIANCES
UPON MAXILLARY AND MANDIBULAR TEETH,
AND
NUMBER OF PATIENTS
SHOWING RESORPTIONS OF THE TEETH AFTER TREATMENT

TYPE OF APPLIANCE	NUMBER OF PATIENTS	NUMBER OF PATIENTS SHOWING RESORPTIONS			—TOTAL— NO. OF PATIENTS SHOWING RESORPTION
		MAXILLARY & MANDIBULAR	MAXILLARY ONLY	MANDIBULAR ONLY	
PIN & TUBE	14	3	0	1	4
RIBBON-BRACKET	50	12	11	1	24
LABIAL	70	1	10	0	11
LINGUAL	85	1	1	0	2
TOTAL NO. PATIENTS	219	17	22	2	41

CHART NO 1
A.H.K.

no resorptions of the mandibular teeth; the remaining two showed resorptions of some of the teeth in the mandibular arch without resorptions of the teeth in the maxillary arch.

This indicates that the maxillary anterior teeth are more disposed to resorptions than are the mandibular.

RESORPTIONS—IDENTICAL APPLIANCES

An analysis of Chart 1 reveals that identical types of appliances were used upon both maxillary and mandibular teeth in the treatment of 219 patients; and that the number of patients showing resorptions of the apical root ends of some of the anterior teeth in either maxillary or mandibular dental arches, or in both, was 41. The number and type of appliances used and the number of patients whose teeth showed resorptions after treatment are shown to be as follows:

The pin and tube appliance was used to treat the maxillary and mandibular teeth of 14 patients, three of whom showed resorptions of the apical root

ends of some of the anterior teeth in both dental arches. One showed resorption of apical root ends of some of the mandibular anterior teeth without resorption of the maxillary teeth, making a total of four patients showing resorptions.

The ribbon and bracket appliance was used for the active period of treatment upon both the maxillary and the mandibular teeth of 50 patients, 12 of whom showed resorptions of apical root ends of some of the anterior teeth in both maxillary and mandibular dental arches. Eleven showed resorptions of some of the anterior maxillary tooth root ends, without resorptions of the mandibular teeth. One showed resorption of some of the tooth root ends in the mandibular arch, without showing resorption of the maxillary teeth, making a total of 24 patients out of the 50 who had resorption of the roots of some of the anterior teeth.

The labial appliance was used for the active period of treatment upon both the maxillary and the mandibular teeth of 70 patients, with only one

CHART SHOWING
NUMBER OF PATIENTS TREATED WITH DISSIMILAR TYPES OF APPLIANCES
UPON MAXILLARY AND MANDIBULAR TEETH,
AND
NUMBER OF PATIENTS SHOWING RESORPTIONS OF THE TEETH AFTER TREATMENT.

MAXILLARY				MANDIBULAR							
NUMBER OF PATIENTS TREATED	APPLIANCES		NO. OF PATIENTS WITH RESORP. OF MAXILL. TEETH	TYPE OF APPLIANCES					NO. OF PATIENTS WITH RESORP OF MANDIB. TEETH	NUMBER OF PATIENTS TREATED	
	TYPE	NUMBER		PIN & TUBE	RIBBON-BRACKET	LABIAL	LINGUAL	WITHOUT APPL'NCE			
36	PIN & TUBE	36	13	0 0	2 3	1 12	1 18	0 2	4	36	
72	RIBBON-BRACKET	72	27	0 0	0 0	3 13	3 59	0 0	6	72	
157	LABIAL	157	17	0 2	1 7	0 0	3 131	0 17	4	157	
16	LINGUAL	16	0	0 1	0 3	0 0	0 9	0 0	0 3	16	
TOTALS	281		281	57	0 3	3 13	4 34	7 209	0 22	14	281	TOTALS

CHART NO. 2
A.H.K.

patient showing resorption of apical root ends in both maxillary and mandibular dental arches, while 10 patients showed resorption of the apical root ends of some of the teeth in the maxillary arch without showing resorption in the mandibular arch.

The lingual appliance was used to treat the maxillary and mandibular teeth of 85 patients, with resorption of the apical root ends of some of the teeth in both the maxillary and mandibular dental arches of one patient only. One other patient showed resorption of the maxillary anterior teeth root ends without resorption of the mandibular teeth.

RESORPTIONS—DISSIMILAR APPLIANCES

Dissimilar types of appliances were used to treat the maxillary and mandibular teeth of 281 patients. Of these patients 57 showed resorptions of the apical root ends of some of the anterior teeth in either maxillary or mandibular dental arches, or in both. These resorptions with the type and number of appliances are shown by Chart 2 to be as follows:

The pin and tube appliance was used to treat the maxillary teeth of 36 patients, while the mandibular teeth were treated by other types of appliances

as indicated by the chart. Thirteen patients are shown to have had resorptions of the root ends of some of the maxillary teeth. Of these thirteen, four also had resorptions of the root ends of the mandibular teeth, viz., two where the ribbon-bracket appliance was used, one where the labial was used and one where the lingual appliance was used.

The ribbon-bracket appliance was used to treat the maxillary teeth of 72 patients, while the mandibular teeth were treated with other types of appliances as indicated by the chart. Twenty-seven patients are shown to have had resorptions of the root ends of some of the maxillary teeth. Of these 27, six also had resorptions of the root ends of some of the mandibular teeth, viz., three where the labial appliance was used, and three where the lingual appliance was used.

The labial appliance was used to treat the maxillary teeth of 157 patients, while the mandibular teeth were treated by other types of appliances, as indicated by the chart. Seventeen patients are shown by chart to have had resorptions of the root ends of some of the maxillary teeth. Of these 17, three also had resorption of the root ends of some of the mandibular teeth where the lingual appliance was used. One of the four showing resorption of the mandibular teeth and treated with the ribbon-bracket appliance upon these teeth did not have resorption of the maxillary teeth.

The lingual appliance was used to treat the maxillary teeth of 16 patients, while other types of appliances were used upon the mandibular teeth as shown by the chart. None of these patients showed resorptions.

RESORPTIONS IN RELATION TO APPLIANCES

Both charts show but few patients treated with the pin and tube appliance in comparison to the other types of appliances. After having made a roentgenographic examination of 35 patients in succession, without finding evidence of resorption, then the three cases following showing the condition, I realize that error is likely to result from a comparison of but few cases.

It has been shown that the maxillary teeth are more susceptible to resorptions than the mandibular, also in the 500 cases studied that where the ribbon-bracket or the pin and tube appliances were used, a much larger proportion of resorptions occurred than where the plain labial arch or the lingual appliances were used.

Reports of additional roentgenographic surveys of treated cases have been received from six orthodontists, ranging from the Gulf of Mexico to Puget Sound. These cases total in number 193, and an analysis shows 44 with resorptions. The type of appliance used and the number of resorptions found after the use of each type of appliance follow:

Pin and Tube Appliance:		
Cases reported treated	2.	Resorption in 1 case.
Ribbon Bracket Appliance:		
Cases reported treated	121.	Resorptions in 35 cases.
Labial Appliance:		
Cases reported treated	42.	Resorptions in 8 cases.
Lingual Appliance:		
Cases reported treated	28.	Resorptions 0.

These reports, while limited to comparatively few cases, show results similar to my findings.

RESORPTIONS—ORTHODONTIC VS. NONORTHODONTIC CASES

Dr. C. A. Hawley reported that the men in the x-ray laboratory doing his work claimed that they found as high a percentage of resorptions of tooth root ends among nonorthodontic patients as among those treated by the orthodontist. In order to determine if his report would apply to this locality, I sought the help of some of our Denver radiodontists. (See Chart 3.) From Dr. I. C. Brownlie's 28,000 cases, we selected 1000 x-rayed in 1920. We found roentgenographic evidence of gross pathology in 662 cases out of the 1,000. Of the 662 cases, 68 had resorption of root apices of teeth with nonvital pulps. Of the balance of 338 cases with the majority of the teeth having vital pulps, ten had

	DR. I. C. BROWNLIE	DR. R. C. BOYD	DR. GEO. R. WARNER	TOTAL
NO. CASES OF COMPLETE ROENTGENOGRAPHIC EXAMINATIONS	1000	512	500	2012
NO. CASES WITH MAJORITY OF TEETH SHOWING GROSS PATHOLOGY	662	223	309	1194
NO. CASES SHOWING GROSS PATHOLOGY ALSO RESORBED ROOTS OF PULPLESS TEETH	68	10	48	126
NO. CASES WITH MAJORITY OF TEETH HAVING VITAL PULPS	338	289	411	1038
NO. CASES WITH MAJORITY OF TEETH HAVING VITAL PULP BUT HAVING SHORT ROOTS	10	NO REPORT	27	37
NO. CASES WITH MAJORITY OF TEETH HAVING VITAL PULP BUT SOME VITAL TEETH HAVING RESORBED ROOTS	3	2	6	11

CHART NO. 3
A.H.K.

short roots (anatomic variations), and three cases out of the 338 had teeth with resorbed root ends.

From the practice of Dr. Robert Boyd, another roentgenologist, we examined x-rays of 512 cases, and found roentgenographic evidence of gross pathology in 223; and among these 223 cases, ten had resorption of roots of teeth with nonvital pulps. Of the balance of 289 cases with majority of teeth with vital pulps, two had resorption of roots.

Dr. George R. Warner, diagnostician for the Smedley Dental Group, analyzed 500 cases. Of these, 309 showed gross pathology (including those showing evidence of bone destruction from pyorrhea). Of the 309 cases showing gross pathology, 48 showed resorption of root ends of pulpless teeth. Cases with majority of teeth having vital pulps 411, of these six cases show resorbed root ends.

Note the great preponderance of cases showing gross pathology. Also note the small percentage of apical root resorptions of teeth having vital pulps, viz., only 11 cases in 1038, or about one per cent. These were all nonorthodon-

tic cases and from the same locality as my orthodontic patients. Compare this with the results shown by Charts 1 and 2 of orthodontic patients in whom 19 per cent have resorptions.

ANATOMIC VARIATIONS

A tooth with a short root is sometimes erroneously classed as one having resorption. The tooth root with apical end rounded into a blunt cone is not usually nor necessarily resorbed. It is normal for some people to have short rooted teeth. Figure 1 shows the maxillary anterior teeth of a large peasant woman, born in Russia. These are short rooted incisors, or anatomic variations from the average length of tooth roots.

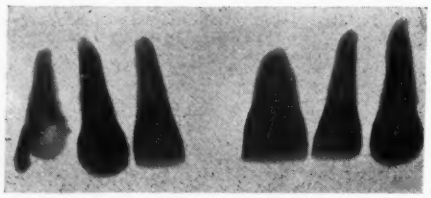
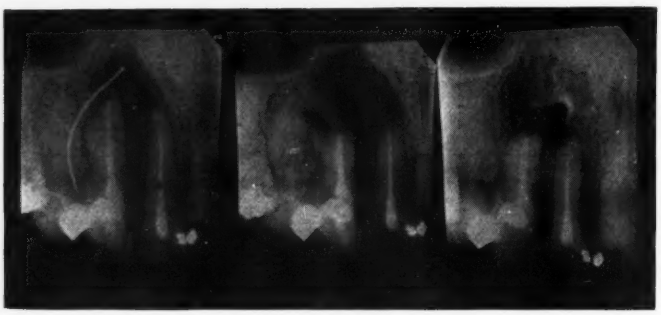


Fig. 1.—Short rooted teeth, anatomic variations, from a Russian peasant woman of large stature.



a *b* *c*

Fig. 2.—Woman, fifty years old. Picture at left shows a diagnostic wire passed through fistulous tract to resorbed area at end of canine root. The second picture shows the same area immediately after amputation of root end and curettement of diseased bone. Picture at right shows conditions five years after root amputation.

AMPUTATED TOOTH ROOTS

To illustrate the difference between teeth having short roots, or anatomic variations, and teeth having resorbed root ends attention is called to Figure 2, which is from Dr. Brownlie's collection. Patient was a woman fifty years old; *a* shows a tooth with normal root length but with an infected area around root apex, *b* shows the root immediately after amputation of the apex, *c* shows it five years after amputation. A case of resorption closely resembles the latter.

INCOMPLETE RESORPTIONS OF ROOTS OF DECIDUOUS TEETH

I wish to show one example of incomplete resorption of the roots of a deciduous molar. Figure 3, *a* shows the mesial root is resorbed at the junction with the crown until entirely separated from the latter, and the distal root is almost separated from the crown; *b* shows the condition six months

later, the retention of the deciduous tooth roots is quite evident; *c* made three years later shows the ends of the deciduous molar roots retained, evidently having become encysted. Dr. Howard Raper has spoken of these as idiopathologic. Such retained deciduous tooth roots are shown quite frequently in the roentgenograms of our orthodontic patients.

RESORPTION OF ROOTS OF VITAL PERMANENT TEETH IN ORTHODONTIC CASES

You are all familiar with resorptions occurring and apparently caused by the close proximity of the crown of an impacted tooth to the root being resorbed. Figure 4 shows roentgenograms of the maxillary incisors and right canine of a boy thirteen years old who came to us from a distance, so his visits were infrequent. In the first series of roentgenograms (*b*), the lateral incisor crown is shown to be touching the premolar crown. The crown of the impacted canine is in lingual relation to the lateral incisor root. This is shown by a study of the three roentgenograms. In the picture at the right (*c*) made with the x-ray tube focused directly over the canine, a small space appears between the root of the lateral incisor and the crown of the canine, while

a *b* *c*

Fig. 3.—(*a*) Deciduous molar just before removal of crown. (*b*) Retained roots six months after the loss of the deciduous molar crown. (*c*) Retained deciduous molar roots three years later.

in the picture made with the x-ray tube focused over the central incisors (*a*) the shadow of the lateral incisor root is superimposed upon the crown of the canine. In other words a tooth in a lingual position apparently follows the direction of the focus of the x-ray tube in the successive roentgenograms, while a tooth in labial position apparently travels in a direction opposite to that of the focus of the x-ray tube.

As we made room for the canine it moved labially and the lateral incisor root was resorbed; this was shown by a series of roentgenograms made a few months apart. Roentgenograms made at the end of twenty months' treatment are shown in *d*, at which time we removed the tissues from over the crown of the canine and found the bone so soft that it cut under very light pressure almost as easily as the mucous membrane. We placed a pin in the canine crown and attached to it a light spring wire extension from the wire arch. By this time the crown of the canine was in labial position in relation to the lateral incisor.

The appliance used in the treatment of Case D was a round labial arch wire of 0.030 cm. diameter resting in hooks attached on labial surfaces of incisor bands as described by me in 1924.[4]

The roentgenograms shown in *e* and *f*, Figure 4, made eighteen months after completion of treatment, show that resorption probably was no longer active. Had we removed the tissue from over the canine crown at the beginning of treatment and moved the canine down lingually (we could not move it labially at first), the root end of the lateral incisor might not have resorbed. It is perhaps only once in many cases that such a resorption might occur.

Dr. John Albert Marshall has contributed already to the solution of the problem of root resorption. As a preliminary study he has made sections of deciduous teeth, the roots of which were lost through the normal physio-

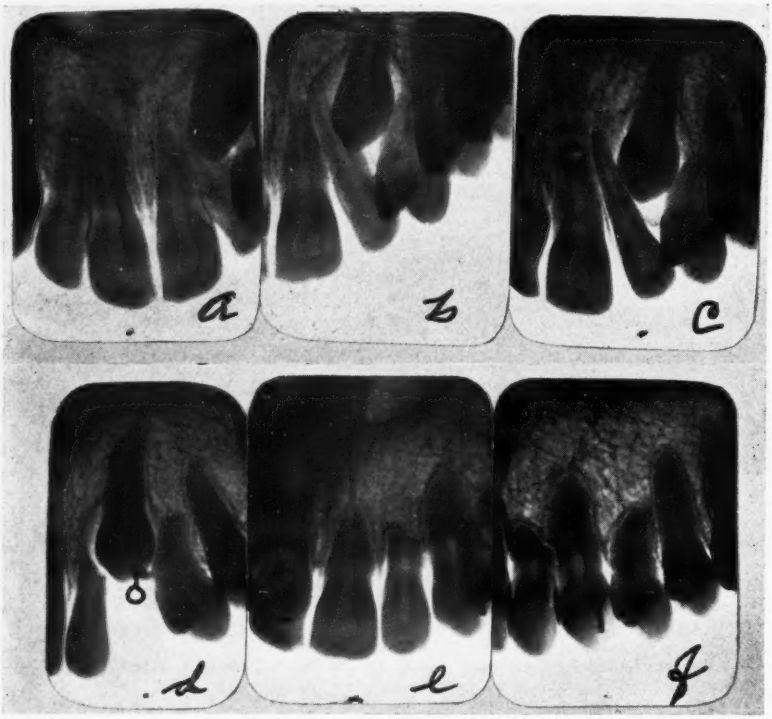


Fig. 4.—*a*, *b*, and *c* show the lingual impaction of right maxillary canine before orthodontic intervention. As space was gained for this tooth, it moved labially and the lateral incisor root was resorbed. *d* shows the condition after twenty months treatment; the canine had moved into labial position, and a pin had been placed in its crown. *e* and *f* shows the condition eighteen months later; evidently resorption of the lateral incisor root is arrested.

logic process. A part of this research was conducted in 1924 and is described in his book, *Diseases of the Teeth*, published by Lea and Febiger, Philadelphia.

The next step was to observe whether any morphologic differences are demonstrable in resorbed root ends of permanent teeth in which the process has been coincident with periapical infection. The manner in which the tooth structure is broken down in these two processes is dissimilar. In the first instance both pulp and peridental membrane contribute to the resorption, in the second only the peridental membrane appears involved. It is quite evident that in deciduous teeth the process is greatly accelerated, whereas, in the loss of apical root tissue through the pathologic process, the rate of dissolution is much slower.

Later Dr. Marshall will compare these two processes with a third, that in which root resorption has occurred in conjunction with tooth movement. Then an opportunity will be afforded for the first time to compare the three types of apical erosion.

Apparently there are many instances in which the calcium-phosphorus value of the blood is so low that the dividing line between proper calcification of tooth roots and resorptions is very slight. This condition is illustrated by Figure 5 of a girl sixteen years old. The roentgenograms at *a*

Fig. 5.—Impaction of mandibular second premolar in a girl sixteen years old. Only the crown and neck of tooth were calcified at beginning of treatment.

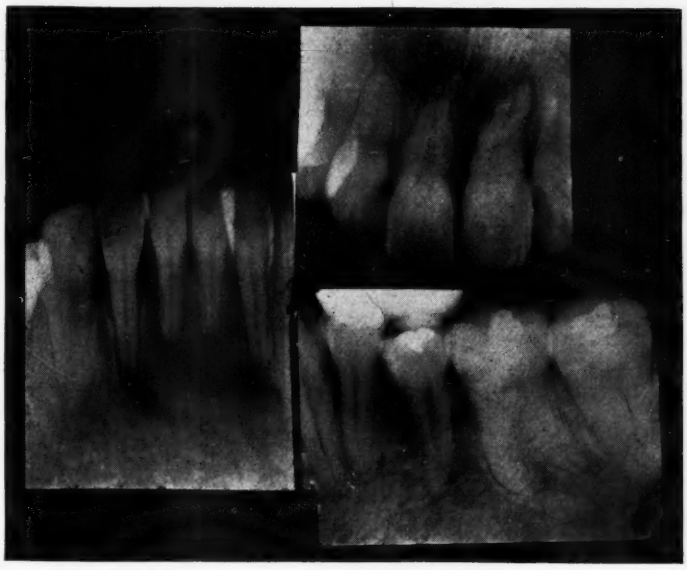


Fig. 6.—Showing same case nine years later with the root of the second premolar fully calcified and resorptions showing at ends of mandibular incisors and maxillary left central incisor. Ribbon bracket appliance had been used upon the mandibular teeth for part of treatment.

show that the right mandibular first premolar crown is against the first molar, with the second premolar impacted having only its crown and the root at neck of tooth calcified. After sufficient space was gained for this tooth as shown in *c*, the dense alveolar process over its crown was removed surgically, and the tooth erupted into its proper place without further aid.

The roentgenograms in Figure 6 show this second premolar nine years later with the root complete in development. They also show resorption of

the mandibular central incisor root ends and a little of the lateral incisor roots. We used a ribbon bracket appliance on the mandibular teeth for part of the treatment. The maxillary central incisors have short roots with resorption of the root apex of the left central.

The point I wish to emphasize in this case is that there was sufficient bone building activity to complete root development of a tooth which was unhampered by the appliance, yet there was not enough to resist the orthodontic intervention when it was in the form of binding the incisors together with the appliance.

The roentgenogram shown in Figure 7 (at top) is that of a fifteen-year-old girl, from the practice of a skillful orthodontist in Texas; a patient whom

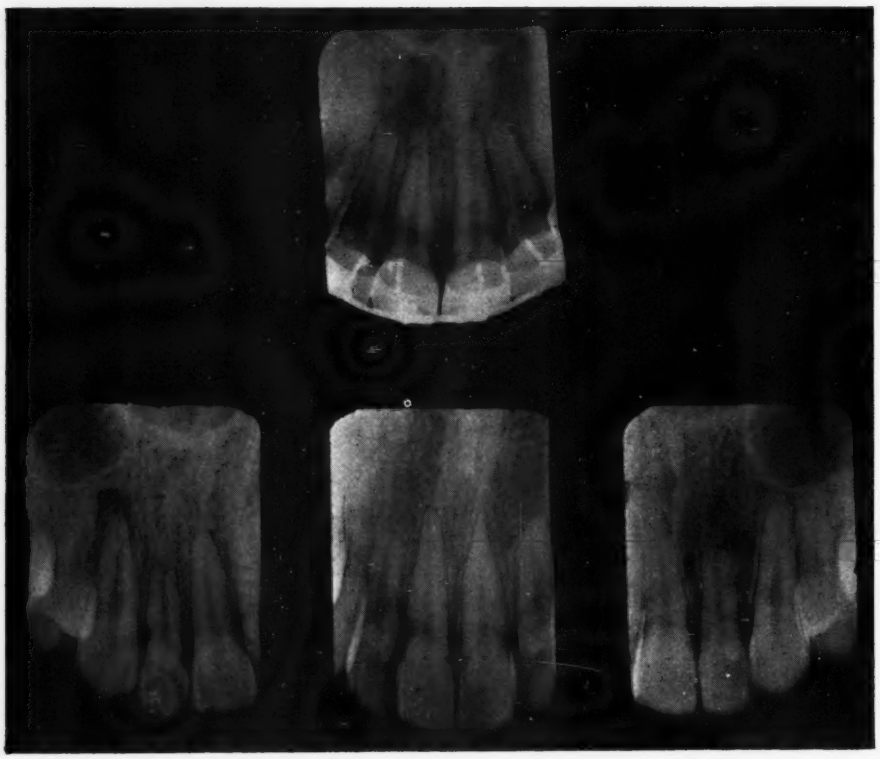


Fig. 7.—The upper picture shows the case of a girl sixteen years old. Ribbon bracket appliance is shown in place upon the maxillary incisors. The lower pictures show the same case two years later with resorption of the root apices of the lateral incisors. A radiolucent area is shown around the apex of one canine root. This tooth responded to tests for vitality, but slowly.

he is treating, using a ribbon bracket appliance, was under my care during the summer months. Roentgenograms made after two years' treatment and retention with the appliance show resorption of the lateral incisor root ends (see lower row). Also a radiolucent area is shown around the root apex of the right canine. This tooth responded slowly to tests for vitality. It is probable that the appliance was adjusted so that the canine root was moved labially either too fast or else too great a distance.

The roentgenograms in Figure 8 (upper series) are from the case of a sixteen-year-old girl made before orthodontic treatment was instituted. At-

tention is called to the short roots of the central incisors with the root apices constricted; attention is also called to the crooked ends of the lateral incisor roots. Compare these with the roentgenograms shown in lower series made sixteen months later. You will note that there is resorption showing

Fig. 8.—Case of a thirteen-year old girl. The upper pictures show that the apices of the lateral incisor roots terminate in definite crooks. The lower row of pictures shows that the crooked root ends of the lateral incisors have been resorbed and that the central incisors have short roots or are anatomic variations.

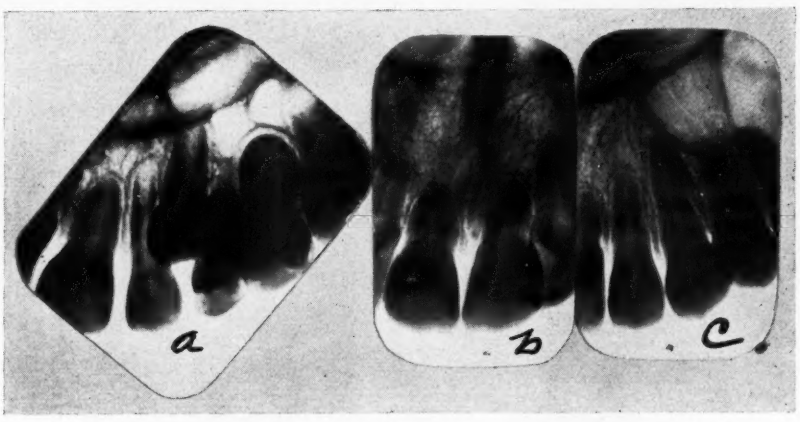


Fig. 9.—Case of an eight-year old girl with the central and lateral incisor roots incomplete in development; *b* and *c* show the case four years after treatment with a condition which may be attributed to either arrested development or resorption.

at the ends of the lateral incisor roots, also that the crooks at the ends of the roots have disappeared. The case was treated with a round labial arch wire resting in hooks upon the incisor bands.[4]

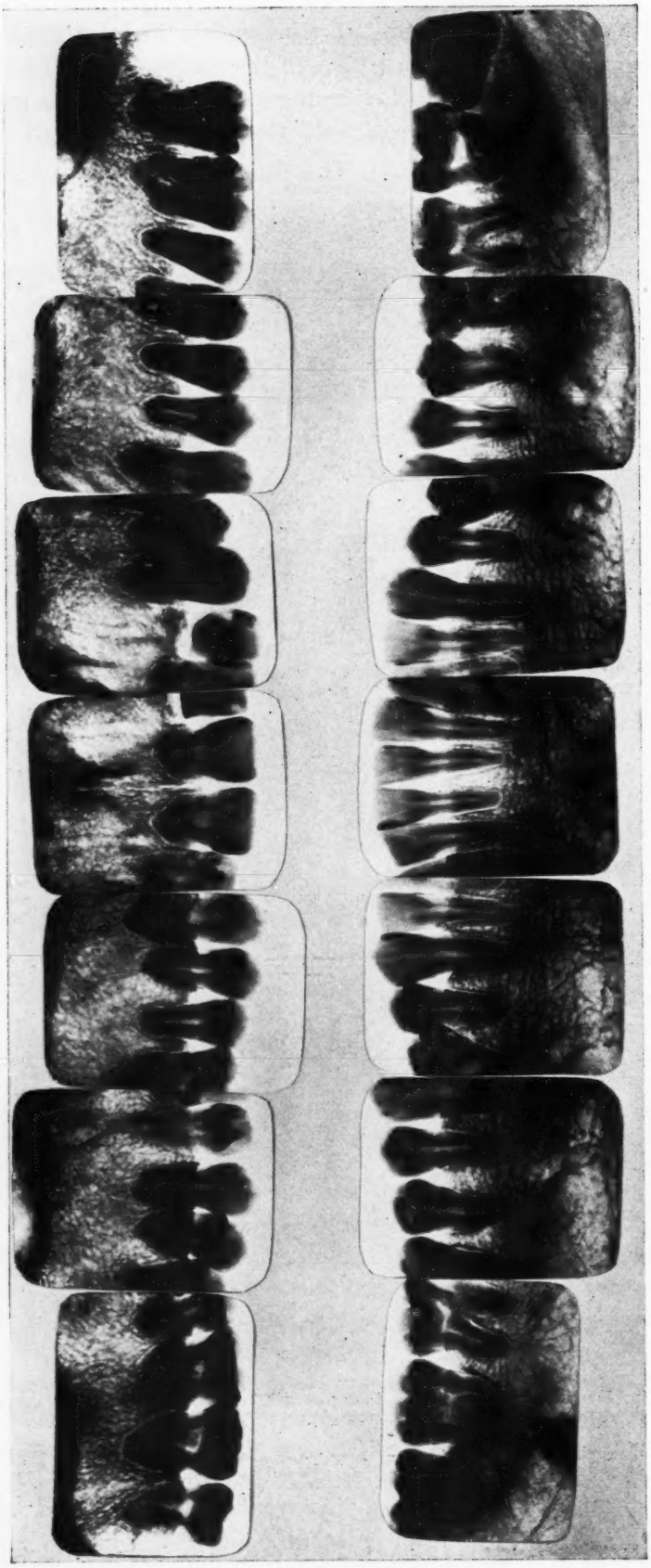


Fig. 10.—Roentgenograms of the teeth in a skull labelled "Mexican Peon," Northwestern University Museum, Chicago. Note extensive resorption of the roots of nearly all the teeth.

The roentgenograms in Figure 9, *a*, show the maxillary teeth on right side of dental arch of an eight-and-a-half-year-old girl before orthodontic treatment. Note that the root end of the central incisor has the appearance of tapering to a blunt cone or a root in process of forming. This, however, might be classed as an anatomic variation. Also note the incomplete formation of the root of the lateral incisor and the partial impaction of the canine. This case was treated with the lingual appliance for two years and then lingual arch wire used for a retainer. The roentgenograms shown in *b* and *c* were made four years after orthodontic treatment was completed. They show a condition at the central incisor root ends and also at the lateral incisor root end, which closely resembles resorption; though perhaps the central incisors should be classed as an anatomic variation and the lateral incisor as showing arrested development. Apparently this is a case in which, without orthodontic intervention, the roots of the incisors would have been short.

RESORPTIONS OF ROOTS OF VITAL PERMANENT TEETH IN NONORTHODONTIC CASES

To illustrate the extremes of resorption of root apices of apparently vital teeth sometimes found in nonorthodontic cases, I shall show roentgenograms of three cases. The first is illustrated in Figure 10. The teeth showing an extreme degree of resorption of roots are in a skull, labelled "Mexican Peon," in the Northwestern University Museum in Chicago. I am indebted to Dr. William Bebb for these roentgenograms and also to Dr. Fred Noyes who called my attention to the skull. You can see the right maxillary lateral incisor root is entirely resorbed, yet the tooth is remaining in the skull. The left maxillary canine and first premolar had fallen out but had been reinserted with cement.

An examination of the maxillary bones revealed that there had been a building on of a great excess of alveolar process over the labial surfaces of the short roots of the anterior teeth, while above the root ends the alveolar process was sunken or resorbed as in an edentulous person.

For the second case, Figure 11, Mr. A. B., twenty-seven years old, I am indebted to Dr. George Warner, diagnostician of the Smedley Dental Group. First note the destruction of alveolar process, indicating pyorrhea around many of the teeth. Also note the resorption of the roots of some of the molars. Particular attention is called to the resorption of the root of the left maxillary canine and of the right mandibular canine. The resorption is irregular in outline. Also note resorption of the apex of the right lateral incisor. Dr. Warner's vitality test report for Mr. A. B. follows:

"The left mandibular second molar gives no response to either ice or electricity. The right maxillary first and second molars give no response to ice but respond to point ten on Cameron Vitalitester. The rest of the teeth respond normally to both thermal and electric shock."

A report of physical diagnosis by Dr. George Packard follows:

"Examination made of A. B.

"His complaint is lack of pep and being unable to gain weight.

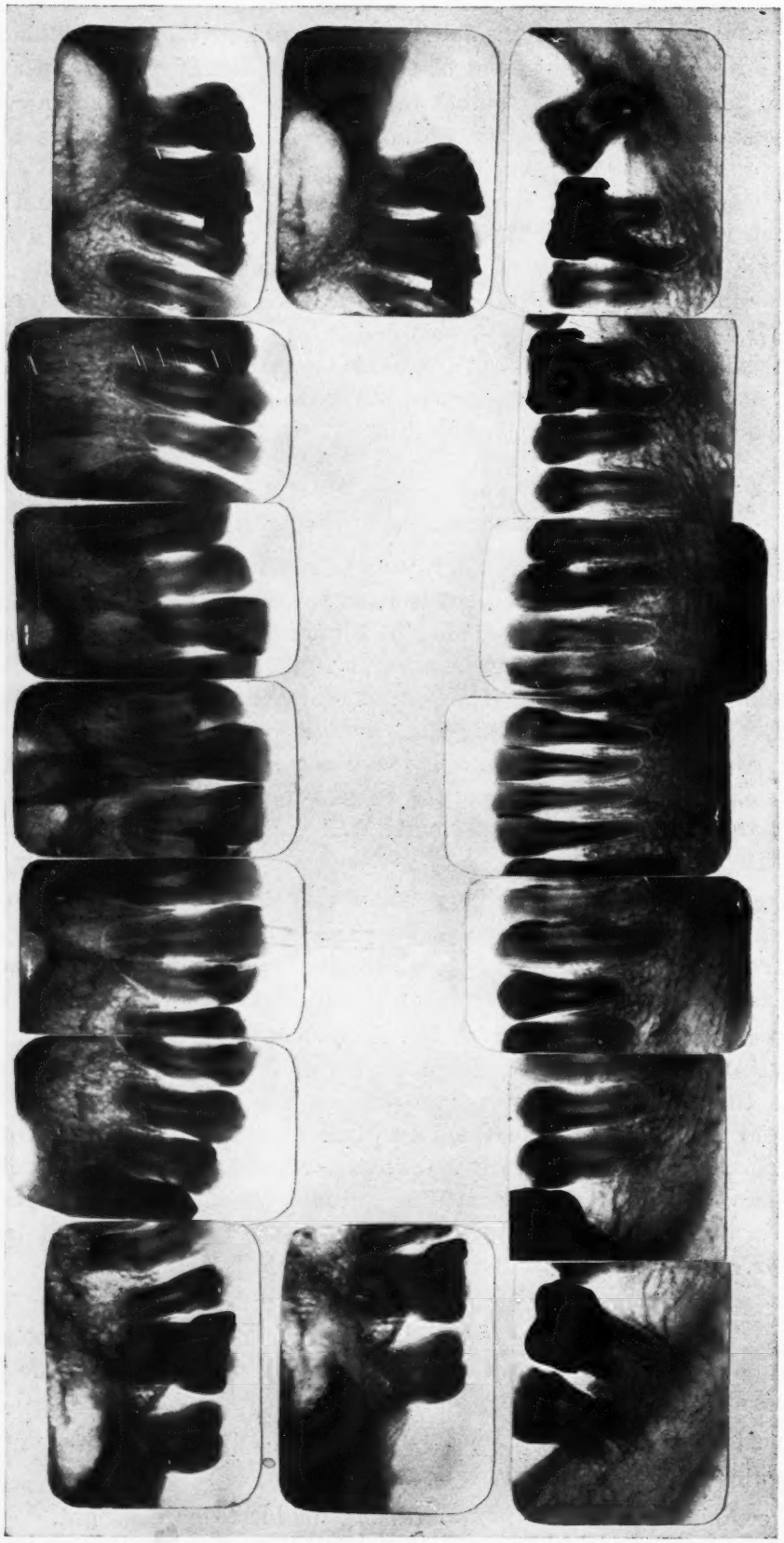


Fig. 11.—Male, twenty-seven years old. Note evidence of pyorrhea or absorption of alveolar process around the necks of some of the teeth, also resorption of the roots of majority of the teeth.

"He is a tall, thin young man who gives the appearance of good health. Examination of the pupils, throat, tongue, heart, lungs, extremities and reflexes reveal no abnormality. Blood hemoglobin is 90 per cent. Urine is 1004, acid, no albumin or sugar."

The calcium-phosphorus determination and Wassermann reaction were made by the Biochemistry Department of the University of Colorado Medical School. The report was calcium, 8.28 mm.; phosphorus, 2.3 mm. per 100 c.c.; Wassermann, negative. The technic followed for calcium was Kramer-Tisdall; for phosphorus, Fiske and Subbarrow. To determine the normal index for an adult the result of the calcium analysis is multiplied by the result of the phosphorus analysis, and should equal 30. The normal calcium-phosphorus product for a child is 40.

The third case is shown by the roentgenograms in Figure 12 of Mr. H. H. S., thirty-six years old, for which I am indebted to Dr. I. C. Brownlie. Note the resorption of the apical half of the molar roots and also of the maxillary second premolar root. The outline of the upper half of the root

Fig. 12.—Resorption of tooth roots in a man thirty-six years old. Note the outline of root socket showing above the left mandibular second premolar.

socket of the second premolar shows that it is filled with a deposit of bone. Dr. Brownlie's charts show that these teeth respond positively to tests with ice for vitality of pulps.

Dr. M. D. Brown's report on Mr. H. H. S.'s health condition follows:

"Family history essentially negative. Age thirty-six years. Married.

"Personal history. Had all children's diseases: diphtheria, scarlet fever, typhoid fever, tonsillectomy in 1911 with stubs remaining which were removed under local anesthesia in 1926.

"Physical condition: Lower respiratory tract normal. Roots of molar teeth absorbed. Frontal sinusitis, right. Mitral stenosis. B. P. 126/70. Hg. 105 per cent Dare method. Coagulation time four and one-half minutes open method. Sensitive to wormwood, ragweed and chenopod groups. Desensitized now. Has not had any hay fever for two years.

"April. Blood calcium 8.1 mg. per 100 c.c. Blood phosphorus 2.0 mg. per 100 c.c. Wassermann reaction negative.

"June. Blood calcium 8.0 mg. per 100 c.c. Blood phosphorus 2.5 mg. per 100 c.c.

"X-ray of para-nasal sinuses. Show cloudiness of all sinuses on right side except the sphenoid. Left are clear."

In this case we have a blood analysis which gives a calcium-phosphorus value of only a little over one-half normal.

The blood analyses of a number of our orthodontic patients has shown similar results, but we are not ready to report on these at this time.

FOODS IN RELATION TO CALCIFICATION OF BONES

I have mentioned the fact that perhaps the majority of children partake of poorly balanced diets, often ill-proportioned in so far as meat, potatoes, white bread, and dessert are concerned and taking only a limited amount of milk, raw vegetables, raw fruits, nuts, raisins, dates, etc. If not guided correctly the child often will choose a diet which is lacking in the essential minerals and vitamines. I shall also suggest that the diet may be well balanced in regard to foods which are supposed to contain the essential minerals and vitamines, and yet these carefully chosen foods may be lacking in the essential minerals and vitamines.

A bulletin published by the Agricultural Experiment Station of the University of Montana, under the title of "Bone Chewing by Cattle"[5] shows that in certain sections of Montana the soil is so deficient in the essential minerals that live stock suffer. Furthermore we have reports of bone chewing by cattle in Texas,[6] and also reports from localities near the sugar beet factories in Colorado where cattle are fattened on sugar-beet pulp. Live stock in certain sections of the United States are reported to eat dirt, whitewash, gnaw at concrete, thus showing distinct evidences of mineral starvation. The flesh from these animals is used for food, also the milk and the milk products are thus used. Vegetables and grains grown upon land deficient in minerals are used for food. The distribution of these foodstuffs is nation wide in this day of ready shipment to all parts of the country.

When considering all these facts, should we not realize that an investigation, carefully conducted, should be made on this subject?

About two years ago while in California during my first intensive study of the subject of resorbed tooth roots, I went to Dr. John A. Marshall and other research workers in the University of California for help and advice. The result was that Dr. Marshall and others at the university became interested in this problem, and through President Campbell and Dr. Karl Meyer (head of the Hooper Foundation for Medical Research), the facilities of the university were offered for research work.

The question of financing this project was next discussed. The university in order to expedite this research made an appropriation to build an addition to its animal-house at the Hooper Foundation, for after due consideration it was decided that the best way to approach this problem was through an orthodontic investigation in biophysics conducted with monkeys and other animals as the experimental subjects. The investigators, including John Marshall, who was to assume active charge of the work, offered to give of their time and knowledge, provided the orthodontists of North America would furnish money for the purchase of monkeys and other animals, for the care

of these animals, and for the operating expenses of the investigation. The problem of financing was first presented to the orthodontists of the Pacific Coast. They supported it in a whole-hearted way, and later it was presented to members of the American Society of Orthodontists, and they also supported the project whole-heartedly.

In conclusion, it is well to remember that in studying any problem it is unwise to form conclusions too hastily. Rather keep an open mind so that when the time comes for an interpretation of results there will not exist any mental bias which might unconsciously influence judgment. I feel deeply grateful to the profession for the whole-hearted support given to this research project, and I am sure that if Dr. Marshall were here he would concur in this. May I also state that it is essential for each one of you to gather all the clinical data on this subject possible. At each subsequent meeting these various facts may be assembled for study and interpretation. In that manner progress will undoubtedly be made.

Where the research which is now being conducted will lead, is impossible to foresee. Dr. Marshall has frequently said that unless root resorption can be produced experimentally, the task of determining further etiologic relations will be extremely difficult. However, we will have a histopathologic picture of the process which may aid us in developing new methods of diagnosis.

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1232 REPUBLIC BUILDING.

DISCUSSION

Dr. A. H. Ketcham, Denver, Colo.—There are several points I could emphasize. They are in answer to the theory of "jiggling" causing resorption of tooth roots. I think it has little to do with it. I think immobilization has a great deal to do with it, as Dr. Neustadt mentioned. It puts the teeth out of function and out of exercise to immobilize them.

Dr. Johnson has very well said that we know but little about the causes of this condition. We are trying to learn something, and it requires the cooperation of each and every member of this Society and of all the men whom we can interest outside of our profession who are research workers in biochemistry, histology, embryology and endocrinology.

Some of you may x-ray a few dozen cases, and because no resorption is found think you are a smart fellow. Do not be discouraged. (Laughter.) You will find resorptions if you x-ray many treated cases. I have x-rayed as many as thirty-five cases in succession without finding a resorption.

Dr. Potter spoke of the tuberculous patient having short-rooted teeth. I do not think that that is true. At any rate I doubt very much if it conforms to the observation of

the men in Colorado who have many patients who are children of tubercular parents. With regard to syphilis, in a few cases of resorptions I had the Wassermann test made with negative findings, but that does not prove anything.

Dr. Epley spoke of an outline chart for radiographic diagnosis and of its great value. The orthodontist has a wealth of material. Dr. Howard Raper suggested to me that orthodontists should go over their cases and chart the first appearance detected in the roentgenogram of the crypt of the third molars, noting the positions. We are doing this by charting third molars, age when crypt first appears and its position, congenitally absent teeth, supernumerary teeth, their position and type, and condition of the alveolar crest, pulp stones, retained deciduous tooth roots, resorptions, etc.

Dr. James McCoy expressed himself very clearly in speaking of the difference between predisposing and exciting causes. We must take the predisposing causes into consideration—foods and state of nutrition. We need the help of the pediatrician and of the biochemist.

Sometimes orthodontists must condemn teeth to the forceps. Such teeth may be moved with orthodontic appliances before they are extracted. An accurate record of pressure application, its direction, duration, and type of appliance used should be kept. Of equal importance is the physical condition. The teeth removed, if possible with some of the surrounding bone, placed at once in a 10 per cent solution of formalin made with a normal salt solution, should be sent to Dr. John A. Marshall. This method costs less than monkeys. The teeth are under actual conditions of treatment, and much valuable information may be acquired even though our control over the patient's diet is not as absolute as that of the diet of the experimental animals.

Dr. Morehouse spoke of lack of incidence of resorptions in the younger patients. I believe that there is some danger of arrested development of tooth roots in the younger patients.

Now you are all familiar with Dr. Percy Howe's work. Many have read his Brother Bill's letter, edited by Dr. G. W. Clapp, which appeared in the *Dental Digest*. They are so good that my partner, Dr. Humphrey, and I have ordered fifteen hundred copies for distribution among our patients and among dentists. These letters show that often in undernourished children a marked improvement takes place through the addition of uncooked vegetables, raw fruits, and additional milk to their diet.

We have prescribed the diet outlined by Dr. Howe, sometimes with the addition of tomato juice and cod liver oil, as used at the Merrill-Palmer School in Detroit, for our patients who were underweight and of retarded growth presenting a condition where clinical experience has taught us to fear root resorptions, and have secured most gratifying results in improving the general physical condition.

I asked the *Dental Digest* to send copies of Percy Howe's letters so that each of you might have one. I appreciate their service in sending the first off the press. They are here for distribution among you men.

A SECOND REPORT OF INFRAOCCLUSION OF THE MOLARS AND PREMOLARS PRODUCED BY ORTHOPEDIC TREATMENT OF SCOLIOSIS*

By Clinton C. Howard, D.D.S., Atlanta, Ga.

(Orthodontist to the Scottish Rite Hospital for Crippled Children, and The Good Samaritan [Endocrine] Clinic)

ABOUT two years ago a report of two cases of infraocclusion of the molars and premolars, produced in a few weeks by orthopedic pressures in the treatment of scoliosis, was made before this society.[1] This second report concerns a description of the changes which occurred during a period of one year after orthopedic casts were removed. The response to orthodontic treatment will also be described.

OBSERVATION FOR ONE YEAR AFTER THE REMOVAL OF ORTHOPEDIC CASTS

Our literature gives practically no information concerning the tendency toward recovery of a malocclusion which was produced by extrinsic influences: we believed, therefore, that some valuable information could be gained by observing the two cases for a period of one year before any orthodontic treatment was begun. At the beginning of this period of observation, records (plaster casts) were made of the relative positions of the teeth, photographs were taken of the faces, and certain anthropometric measurements were noted.

Both cases were examined every four months. At the end of twelve months we were able to find only a slight tendency in either case to relapse to its former normal state. The soft tissues adjacent to the teeth (based on history) were healthy before orthopedic treatment; at the beginning of our observation they were highly inflamed in the molar, premolar and lower incisor region. By the end of twelve months the soft tissues showed a marked improvement which occurred without any treatment by medication or otherwise.

After the twelve-month observation we felt justified, through orthodontic means, in attempting a correction of not only the errors in functional occlusion but also the disharmony in facial contour.

DIAGNOSIS BASED ON A DEFINITE HISTORY

Diagnosis was so very definite in both cases as to make a formula of orthodontic pressures quite accurate in application. First, we knew that the molars and premolars had been depressed, causing the face to become shorter from the nose to the chin. Second, we knew that the lower incisors and canines had pressed upward upon the lingual incline surfaces of the maxillary anterior teeth thereby causing this upper group to tip labially; whether

*Read before the Southern Society of Orthodontists, April, 1928, Baltimore.

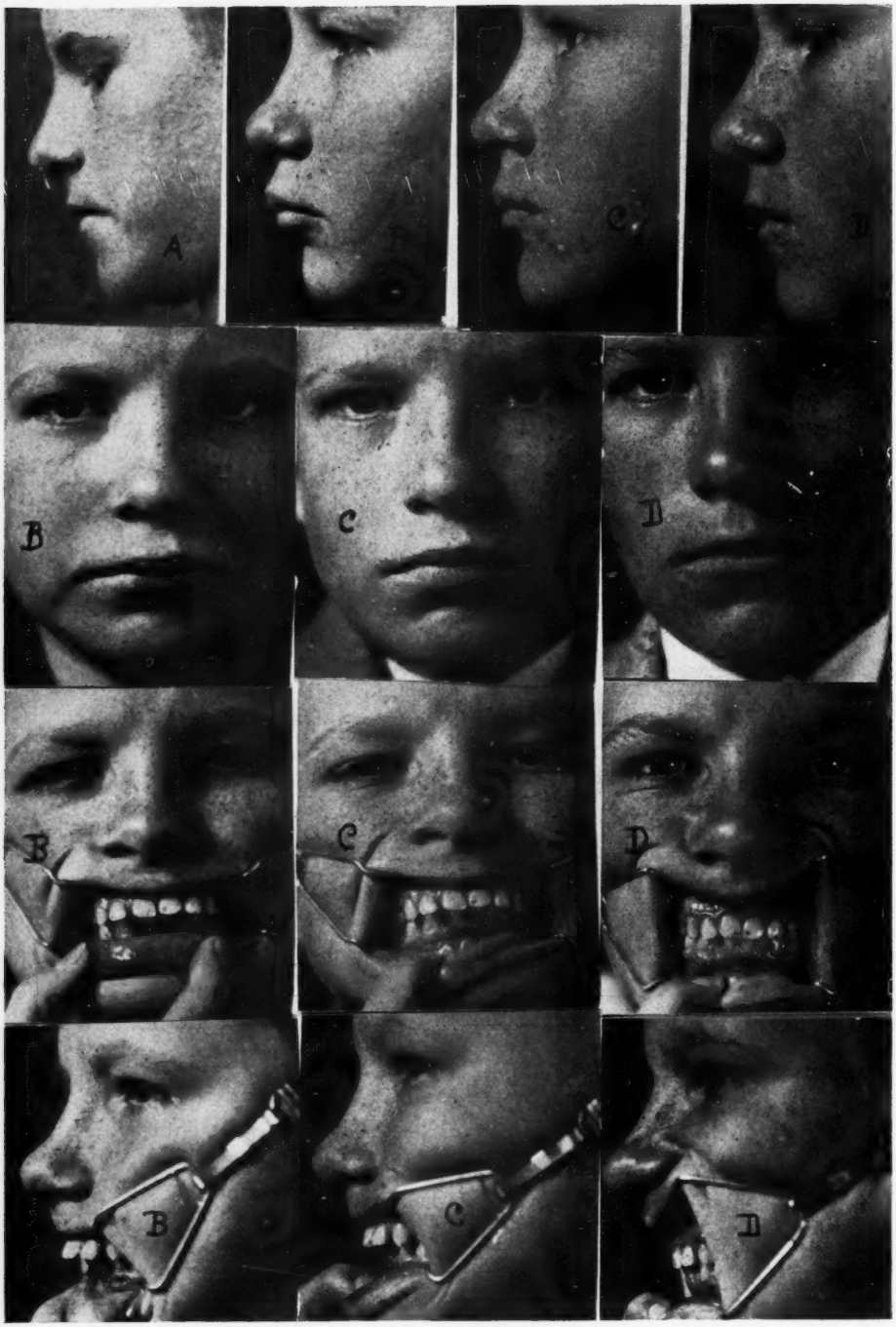

Fig. 1.—*A*, photograph of case taken from hospital records, made before orthopedic cast was applied. *B*, showing effects of the upward pressure on mandible; photographs made after the removal of orthopedic cast. *C*, compare with *B*, and note the slight changes which occurred during twelve months of observation. *D* shows the results of orthodontic effort in restoring the face and teeth to normal.

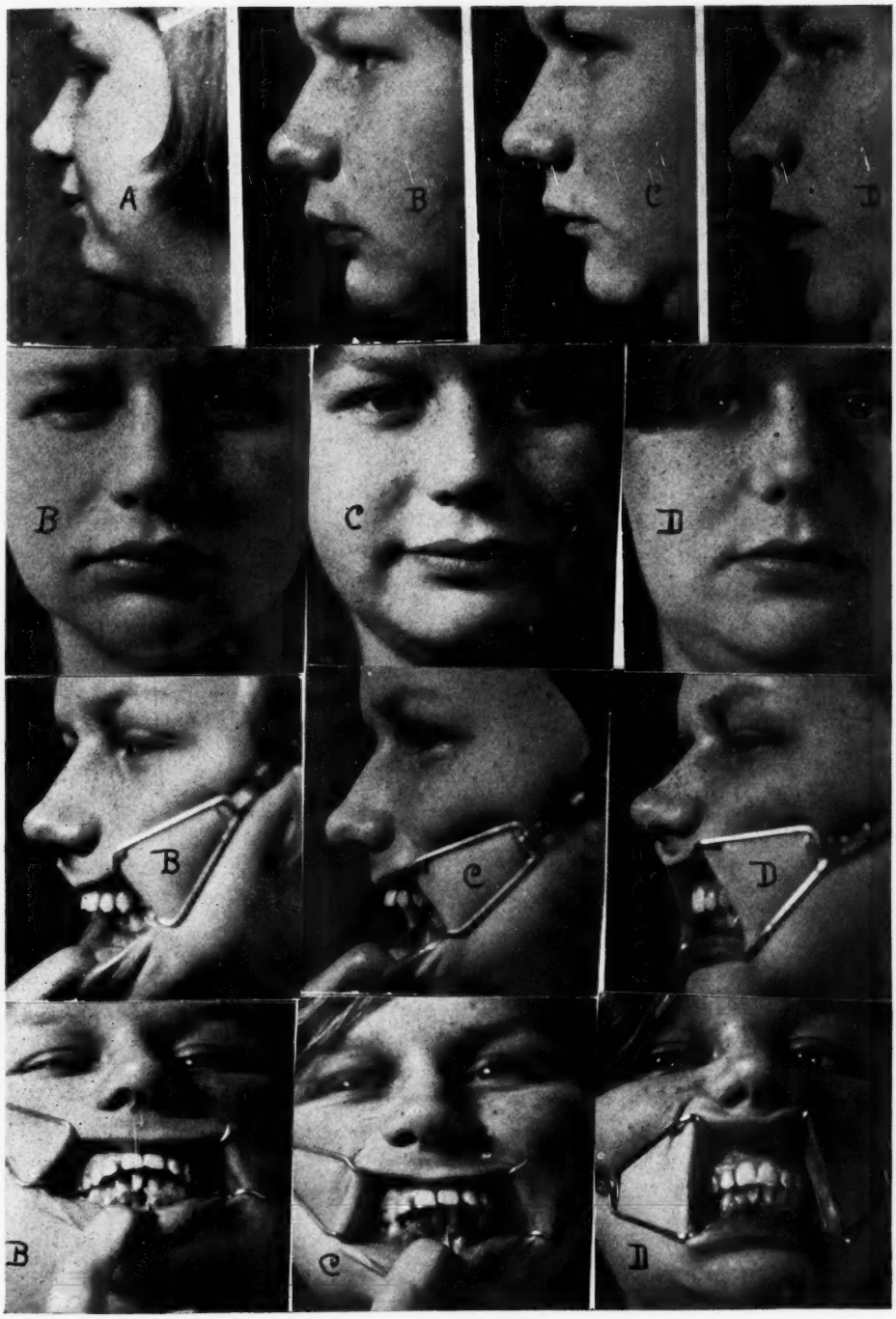

Fig. 2.—*A*, photograph of case taken from hospital records, made before orthopedic cast was applied. *B*, showing effects of the upward pressure on mandible; photographs made after the removal of orthopedic cast. *C*, compare with *B*, and note the slight changes which occurred during twelve months of observation. *D* shows the results of orthodontic effort in restoring the face and teeth to normal.

or not either the maxillary or mandibular anterior group had been pressed into their sockets was of course impossible to determine accurately. From a close analysis, however, we concluded that if these teeth had been depressed at all their vertical displacement in their relation to their respective jaws was of no consequence. This in substance constituted our diagnosis and, therefore, indicated the character of orthodontic influences which would best restore the displacements to a normal condition.

MECHANICAL THERAPY

We placed bands on the four first permanent molars. On the mandibular dental arch we applied a Mershon lingual wire of .040 diameter (white-gold alloy). To this we attached flattened spurs of .030 diameter which were extended over the incisal edges of all anterior teeth. A spur was soldered to the buccal surface of each mandibular band for attaching elastics. To the maxillary molar bands we attached horizontal round tubes on the buccal surfaces. Into these tubes was fitted a .040 labial arch wire. Hooks for elastics were soldered to this arch wire in the region of the maxillary canines. No stops were put on the arch wire to prevent the wire from sliding distally through the buccal tubes. Because of the extreme slant or tipping of the maxillary incisors two labial spurs were extended from the labial arch wire over the incisal edges of the two centrals. This was done to prevent the arch wire from sliding upward upon the soft tissues. Number five elastics were attached as follows; from the hooks on the labial arch wire back and over the distal end of the maxillary buccal tubes and down over spurs on the buccal of the mandibular molar bands.

With this arrangement, so simple in design, we obtained influences in exact accord with our diagnosis. There was, through elastic arrangement, an elevating influence upon the molars. As they erupted to a higher plane, thereby lengthening the face as well as opening the bite of the anterior group, the backward pull on the maxillary incisors by the elastics caused them to tip lingually. The spurs resting over the mandibular incisors and canines were acting only as retainers to prevent them from possibly seeking a higher plane of occlusion while the jaws were being lifted apart.

In the case of the boy progress was astonishingly rapid. He visited the office every ninety days. With the exception of a few very minor adjustments, by the end of twelve months we removed all active pressures with results as pictured in Figure 1—*A, B, C, D.*

The girl's improvement, though quite encouraging, was not so rapid. We know that her cooperation in the wearing of elastics was somewhat deficient. Her case at the present time is illustrated in Figure 2—*A, B, C, D.*

A third and last report on these cases will be made after an observation of one year during which time all appliances will be absent from both mouths. In that report a detailed comparison of all anthropometric measurements will be given as well as accrued information which appears applicable to orthodontic diagnosis and treatment of infraoccluding cases.

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20 DOCTORS BUILDING.

DISCUSSION

Dr. N. F. Muir.—I should like to ask if a plaster jacket similar to the one used by the orthopedist would serve in reducing certain open-bite cases where the molars are in supra-occlusion?

Dr. C. B. Mott.—Is there an effort being made by the orthopedic surgeon to change his procedure so as to avoid an upward pressure on the mandible?

President Kelsey.—A case, very similar to the ones Dr. Howard has described, was once under my observation and treatment. This patient was an adult, and we elected to make some extractions. Our results were gratifying. The orthopedic pressures produced very similar results in this case as Dr. Howard has illustrated.

Dr. F. B. Noyes.—I would like to suggest the possibility that the conditions which produced the scoliosis are concerned in the production of the malocclusion under treatment. In other words, the spine has become curved because of conditions of the bone of the skeleton in general and because of those conditions of the bone of the skeleton in general the bones of the maxilla and mandible will not stand the added pressure without deformity.

Dr. Howard (closing).—Dr. Muir's question reminds me of an attempt made about two years ago to close an open-bite with an orthopedic plaster jacket similar to the ones used in the treatment of scoliosis. We felt that the case could be handled better by placing the patient in a hospital. We applied the jacket and obtained a depression of the posterior teeth. The open bite was closed about one-eighth of an inch, the face being made that much shorter from the nose to the chin. After the jacket was worn for a little more than two weeks, it was removed and a plaster head and chin-cap was applied. There is no doubt but that the face can be shortened by such a method.

Dr. Mott's question can be answered in the affirmative; however, the changes made have not been entirely successful in preventing a depression of the posterior teeth.

I was glad to hear Dr. Kelsey's experience with such a case and appreciate Dr. Noyes' comment concerning the probable integrity of the bones in this type of individual.

European Orthodontological Society

The Fifteenth Annual Meeting will be held at Heidelberg on Tuesday and Wednesday, May 21 and 22, 1929. A cordial invitation is extended to all members of the profession interested in Orthodontics to attend the meeting. For further particulars apply to the Hon. Secretary A. C. Lockett, 75 Grosvenor Street, London, W. 1. On the two days following—May 23 and 24—the Deutsche Gesellschaft Zahnärztliche Orthopädie will meet at the same address, namely, the big Auditorium of the New Medical Clinic in Heidelberg, and these two meetings will constitute a joint congress of the two Societies.

CARE OF CHILDREN'S TEETH*

By Juanita Wade, D.D.S., Dallas, Texas

PEDODONTIA, a new phase of dentistry, is a great step in securing better health and greater happiness for the boys and girls of today, for the men and women of tomorrow. We may congratulate ourselves as we have seen that a great field for good lies before us in the proper care of the deciduous dentition. In the future the dentists cannot be satisfied with just repairing and patching the human denture of the adults, for an educational movement is sweeping over the country, which is teaching our parents the need of better dentistry for children.

Often parents have to beg the dentists to care for their child's mouth, and many leave the offices without any care as the dentist says, "Oh, they will abscess if I fill them," and similar statements. It is time that we should awaken members of our own profession to the importance of this phase of dentistry which includes the care of the deciduous teeth and early care of permanent teeth.

The field of children's dentistry has appeared too tedious and nerve-racking, too unremunerative both in finance and in gratifying results. This, of course, has caused the average practitioner to give it nothing more than a passing thought, but thanks to a few of our members, that day has gone. Numbers have realized the importance and have developed a technic for supplying it, which is simple and effective. These have organized with the purpose of placing this phase of dentistry where it should be, just as the orthodontists a few years ago had to teach the average practitioner the need of "straightening" children's teeth.

The deciduous dentition serves the child through its greatest formative period, which is between birth and twelve years of age. We may insure future health for the child if during this critical period all normal physiologic functions have acted smoothly. This, of course, cannot be accomplished if the child has not masticated his food so that it may be properly assimilated. With poorly developed arches and with broken down teeth, the child only bolts his food. This overworks the digestive organs, thereby the general body nutrition and development is slowed up, and we have a sickly child. The influence of diseased teeth upon the general physical condition and appearance of the child is very easily discernible.

If teeth are lost early, the function of the muscles is delayed, and this prevents the proper growth of both muscle and bony structures. The bones of the head cannot develop if the muscles which are attached to them, do not function. Eighty per cent of children chew on one side of the mouth as a result of an involuntary habit caused by a sore tooth early in life or by an imperfect occlusion of the cusps of the teeth. A similar lack of development

*Read before Southwestern Society of Orthodontists, Dallas, Tex., Jan. 2-5, 1929.

may be produced also by giving the child soft food which requires no mastication. It is my opinion that the general practitioners of dentistry should assume this responsibility of educating the child in the value of the function of his teeth.

The deciduous teeth need to be retained until normally shed to maintain space for the permanent teeth. The roots of the deciduous teeth, particularly the roots of the deciduous molars, guide the eruption and position of the permanent teeth. The crowns of the premolars of the developing permanent set, lying as they do between the roots of the deciduous molars, are maintained in a definite position. If the deciduous tooth is lost early, it often causes the premolars to rotate in the arch and erupt improperly. The normal shedding of teeth is a big factor in assuring normal eruption of permanent teeth.

The care of the deciduous teeth is all important in the prevention of various pathologic lesions. The toxin absorbed by the child from an abscess is as potent and dangerous as that absorbed by the adult. The child of a very few years, has not built up an immunity in its system to the different forms of infection and is less able to combat infection than is the adult. No enlightened dentist of today advises an adult to retain an abscessed molar. Not all pulpless teeth should be extracted, but most of them, in my opinion, should be. It depends upon several things: the age of the child, whether the child is controllable, amount of destruction of the crown, amount of resorption and shedding time of the tooth, systemic conditions of the child, and extent of pathology.

Often in my practice children are seen, who, before there is any local soreness about a tooth, will complain of headache and nausea and will run a high temperature. Many times the pulp will die and become putrescent without the child having suffered any pain. After the pulp becomes putrescent the bacteria which are present are absorbed by the blood stream. The bacteria may lodge in a distant organ and produce pathologic lesions. Rheumatism, heart lesions, kidney trouble and nervous disturbances are the most common diseases produced from infected teeth.

In some cases the children just refuse to eat, but after the infected teeth are removed, the appetite improves and they can masticate on hard, healthy gums better than they could on sore teeth. Pediatricians refer children suffering with kidney and bladder infections. Often when the infected teeth were removed, I have seen the pathologic condition clear up without any further medical treatments. I could continue to cite cases where a definite relationship has been shown between infected deciduous teeth and the ill health of the child. I hope these cases will show you that infected deciduous teeth are a menace to the health of the child.

The question of diet is an important one, but I will not attempt to go into it in this paper further than to say it comes within the realm of children's dentistry. The dentist should advise the mother as to the necessity of a correct diet, both during pregnancy and following, so as to insure the proper materials for building a healthy child with sound teeth. Of course, the physician should prescribe the correct diet, but often he does not; then it is time for the dentist to teach his patient, not only naming the foods but also giving instructions as to how to cook the food, as this help will be gladly accepted by the average

mother. An abundance of fresh green vegetables, whole milk, whole wheat bread, fresh fruits (especially oranges), are essential and beneficial.

The biggest problem in children's dentistry still lies before us, that is, handling the child. Any one attempting to work with children must largely solve the problem as best he can for himself. The essential factor is primarily to gain their confidence. It is necessary that the operator understand child phychology, as each child has to be handled differently. When you first meet a child, try to make him like you by talking and showing him different objects in the office. If a boy, show him how the chair goes up and down or things that would interest a boy. One children's operator, whom I have visited, always has his window full of toys and articles that represent the coming holiday, as "Fourth of July," "Thanksgiving," or "Christmas." Some children like the idea of your giving them something, even something as trivial as a cotton roll for a doll pillow, or a bottle with which to play doctor.

The child should be taken to the dentist about the time that all of the deciduous teeth have erupted. Nothing should be done at this time but to acquaint the child with riding up and down in the chair. If the child does not seem nervous, a prophylactic treatment might be given. The child, having a pleasant time will be glad to return if further operative work has to be done. This can often be done without any interference from the child, as the confidence was gained on the first visit. The operator should have a short talk with the parent about the future care of the child's mouth.

One of the most essential elements in establishing a successful practice of pedodontia is to establish the plan for periodic examinations. This, to my mind, is the most important step in educating the child as to the value of the care of the mouth. This habit formed early in life, will probably be carried throughout his lifetime. Of course, some should be seen more often than others, just how often depending upon the susceptibility of the individual.

The examination of any child should be very thoroughly made and accurate records kept. Such an examination should consist of a critical survey of the teeth for cavities, of the gingivae for inflamed areas, deposits of calculus, of contacts, location and depth of pockets, condition of pulps, missing teeth, loose teeth, the occlusion, condition of the mouth as to cleanliness, and by all means, a set of radiograms should be made

X-rays often save many embarrassing situations, particularly if the child has to be referred to an orthodontist for treatment, or referred to an exodontist for extraction of deciduous teeth, which might have been saved if proper treatment had been given. In some cases, where indicated, an inquiry should be made as to general health, the diet, and various habits.

It is essential, if we are to be able to do our work and do it well, that we have the child in the frame of mind where he will cooperate with us. Very few children will tolerate pain; therefore we must see to it, after we get them in the right frame of mind, that our work will be as painless as possible. A great amount of pain can be avoided if we take sufficient time and care, by using sharp burrs or stones at a high speed, light pressure, and sharp cutting instruments.

We must not keep the child in the chair long at a time, as he tires too quickly. For this reason it is best to make short appointments. To ask the

operator to do severe dental work for the sickly, nervous, timid child, late in the afternoon after he has been in school all day, is unfair to both child and dentist, as both are tired and neither one is equal to the strain of the task.

Now, let us consider operative technic in children's dentistry which differs a little from that in permanent teeth. In the preparation of cavities in deciduous teeth, one must constantly bear in mind their peculiar anatomic characteristics, remembering that the pulps are large and comparatively close to the surface. Also the dentin is coarse and consequently cuts much more easily under the burr. The V-type of proximal cavity without the occlusal step is to be condemned. A vast number of failures of fillings in deciduous teeth and consequent pulp involvement and loss of the tooth can be attributed solely to this type of cavity preparation. It does not furnish sufficient anchorage for the filling material, and a loosening of the filling results. In all cavities in posterior teeth, where bulk of tooth structure permits, an occlusal step should be prepared. An attempt should be made to secure as nearly as possible a flat gingival and pulpal seat. Slight undercuts in the proximal portion of the buccal and lingual should be secured, with care, however, to avoid pulp exposure.

In excessively deep cavities in deciduous teeth, one should remove as much decay as possible, sterilize the remaining thin layer of dentin with Howe's ammoniacol silver nitrate and then fill with a thin mixture of copper cement, being sure not to put much pressure on cement. This is germicidal and wears well, although it is well to watch all cements. Of course, the contour cannot be kept as well as with a metallic filling. It is my experience that hundreds of deciduous teeth have been saved with this, where if alloys had been used the pulps would have died and abscessed. If a tooth is lost before normal time, a retainer should be made. There are many different types simple to make, so no operator should pass up this step of preventive dentistry. Whenever it is possible to prepare a cavity for a metallic filling, I prefer silver alloy, as it may be carved to give the proper contour and preserve the contact point. If the cavity is deep, line the base with a thin mixture of copper cement, let it set, straighten up the walls with a chisel or small stone, and place the amalgam. This must be polished at another sitting. Care must be taken not to have overhanging margins which irritate the free gingival margins. This is accomplished by carefully placing a small matrix held in place by a small, soft piece of wood (such as a match stick, cut down). This does not hurt the gums as a large band and retainer would do. If course, this question of filling material for children's teeth is argued about as much as the question of pulpless teeth. If cavities occur in the anterior teeth on the approximal surfaces, they can be stripped out with a small cuttlefish disc and wiped with a silver nitrate solution or filled with silver amalgam. I have used silver amalgam a great deal. If these anterior teeth are lost early from an accident or decay, they should be replaced by a small bridge which not only retains the space but aids the young child to articulate properly where otherwise he could not. Some operators are advocating small bridges in the posterior to replace the deciduous molars when lost early, so the child can masticate his food and to keep the opposing teeth in proper alignment.

A general operator should never lose sight of the importance of seeing the mouth as a whole every time he makes an examination. Often slight defects can be noticed early and be corrected sooner. For instance, if at five years the deciduous teeth do not have spaces between all teeth, the child should be referred to an orthodontist for observation.

During the period in which the deciduous teeth are being carefully watched, the first permanent molars are erupted, and often are neglected. We, who are interested in preventive dentistry, must adopt a procedure for the preservation of these molars.

First, these molars are the largest of the masticating teeth and perform the heaviest work in the mastication of foods.

Second, they are present at the time when the deciduous molars are being lost, and they are often the only molar teeth in the mouth.

Third, they are the keystone of the dental arch, and they are necessary for the symmetrical development of the jaw, and they aid the proper eruption of other teeth.

Fourth, their loss destroys the proper relation of the other teeth of the arch and brings about a traumatic condition which injures the soft issues.

If these teeth are so important, the question arises: "Shall we wait until decay is advanced, or shall we so prepare the teeth that there are no retention places for decay to start?" This is one big question that is before the profession today.

Several methods have been advanced, such as:

First, smoothing the grooves with a round burr or stone and polishing the enamel rods.

Second, filling the grooves with cement.

Third, using silver nitrate.

Fourth, cutting the groove out and filling with amalgam.

Dr. Thaddeus Hyatt of New York has said if an explorer sticks anywhere along the line of coalescence known as the developmental groove, operative procedure is indicated. These small fillings should be of silver amalgam, especially if the tooth has just erupted. Not only the occlusal surface should be carefully examined, but the buccal pits and lingual pits should be watched very closely, as often decay in the buccal pit will extend to the pulp before it is found.

We must not lose sight of the fact that good dentistry means not only the ability to execute a fine looking filling, a well balanced bite, but also a better understanding of the biologic and physiologic considerations involved in dealing with vital tissues upon which the work is being done. A pathologic condition is often found in children's mouths where bands are worn. This must be carefully watched, as we must not get the absorption of the alveoli early, as often it is the seat of future infections.

I trust that I have made it plain that children's dentistry is just as important as adults', and also that if time is taken and one is interested in this field of dentistry, equally as good results can be obtained in restorative work.

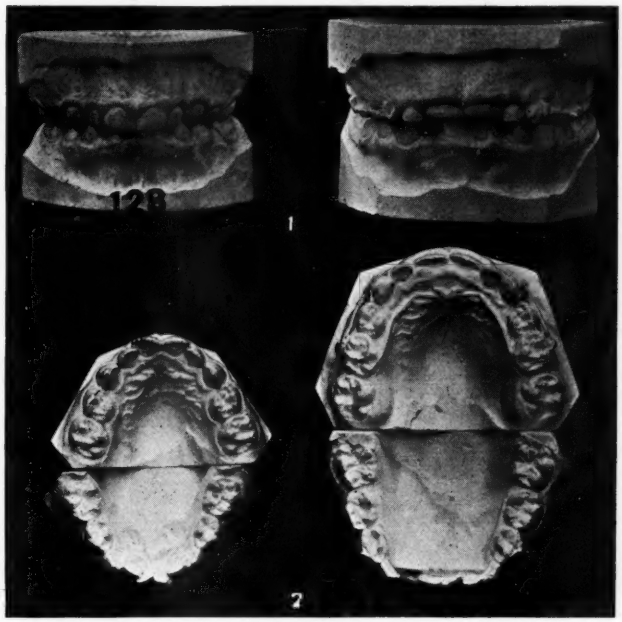
One should never see a child's mouth without advising the parent of the necessity for the proper care of the teeth. If what I have said will cause any one here to be more careful in taking care of his young patients, I will feel that the time has been well spent.

MEDICAL ARTS BLDG.

INFLUENCES EXERTED ON THE ERUPTION OF THE PERMANENT TEETH BY ORTHODONTIC DEVELOPMENT OF THE DECIDUOUS DENTITION*

BY ASHLEY E. HOWES, D.D.S., NEW ROCHELLE, N. Y.

ALTHOUGH the subject which I am presenting comes under the heading of case reports, my object is not to present a specific case report. None of the cases that I am going to show are finished and therefore they can only be regarded as preliminary reports. However, I think that the radiographs made



Figs. 1 and 2.

of these cases before and during treatment do show the definite effect exerted on the position of the permanent teeth by orthodontic development of the deciduous arches. This evidence is presented in support of the mass of other evidence which has already been offered by other men along these lines.

Figure 1 shows the case of a girl six years old. You will note that occlusal relations of the case are good but developmental spacings are entirely lacking, in fact, there is a definite overlapping of the incisors. Judging by the radiographs and the measurements of the deciduous teeth, as worked out by Dr. Stanton, we find that this case is to have very large permanent teeth.

*Read at a meeting of the American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

Figure 2 shows the definite overlapping of the teeth that I mentioned. Now using Dr. Stanton's most interesting discovery of the relation between the total mesiodistal length of the side unit of the deciduous teeth (consisting of the second deciduous molar, first deciduous molar and deciduous canine) and the space that should exist between the deciduous canines to accommodate the four permanent incisors, we find that this arch needs about 9 mm. expansion. In other words, the mesiodistal diameters of the deciduous canine, first deciduous molar and the second deciduous molar total 26 mm. The distance between the deciduous canines is 16 mm. The difference between the two measurements is 10 mm., which is probably a little more than the amount of

Fig. 3-*A*.

expansion the case needs. Of course we cannot hope to get all this at one time, but certainly it is time for something to be started.

Maxillary and mandibular Stanton sliding devices were placed as is shown on the second model, and by means of small elastics placed by the parent the case was expanded as shown. This expansion was accomplished in about fourteen months, but the second set of models was not made until eighteen months later. Please note that in that time the permanent molars have erupted and have followed along with the deciduous teeth, although the appliance did not touch them. The two mandibular centrals have erupted, as have the maxillary centrals. The arch is not yet large enough to accommodate these large permanent teeth.

The radiographs shown in Figure 3 (*A* and *B*) illustrate the effect which this expansion had on all the surrounding bony structure. See the unfolding

of the permanent incisors before their eruption. Please note the parallel forces which have been at work in these devices.

In Figure 4 you can see more clearly the unfolding of the permanent teeth while still unerupted with the deciduous incisors still in position.

These two radiographs were taken about seventeen months apart. The second set of impressions were taken after the two centrals had erupted, which was about five months after these radiographs were taken.

From the two views of Figure 5 (*A* and *B*) we can see that this appliance has not caused excessive absorption of the roots of the deciduous teeth. In

Fig. 3-*B*.

other words, I feel that this treatment fits in with our desire for a physiologic development of the arches.

The case illustrated in Figure 6 is a brother of the girl whose case was just described. He was about seven years old. The expansion was done in a similar manner by means of the sliding devices, except that in this case the mandibular second deciduous molars were banded instead of the first as in the previous case. The object of this was to enable us to use intermaxillary elastics, as it was a case of distoclusion.

As the necessary space was obtained, the incisors erupted as shown.

Figure 7 gives a better idea of the amount of expansion produced. In this case, since we have one permanent incisor erupted, we can use this tooth to

Fig. 4.

judge the expansion required. This tooth is 6 mm. wide. Generally the lateral is about half a millimeter wider. Therefore, the total width of these four permanent anterior teeth would be about 25 mm. Allowing for the curvature

Fig. 5-*A*.

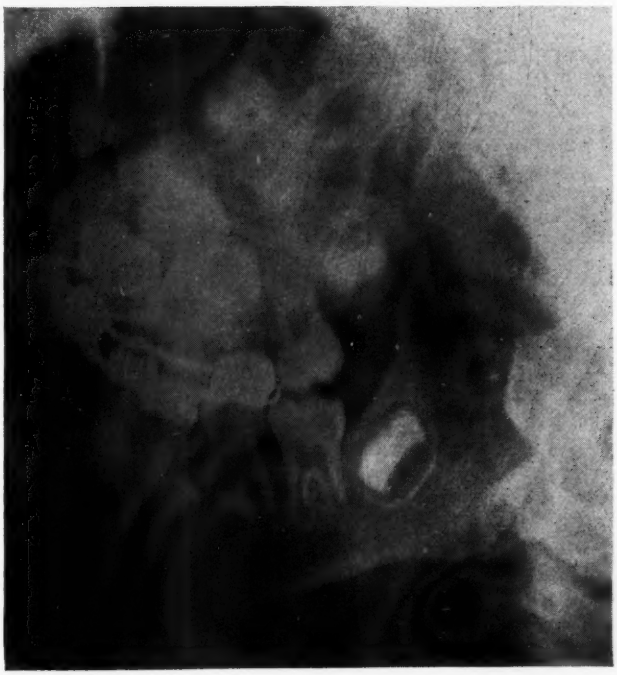
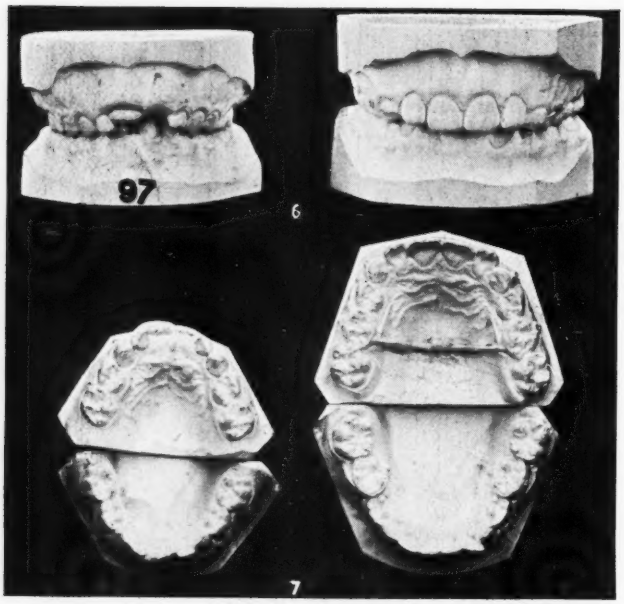


Fig. 5-*B*.

of the arch, the space between the mandibular deciduous canines should be just a little less than this. It actually measures 18 mm. The case needs about 7 mm. expansion. Checking up on the measurements of the deciduous teeth,



Figs. 6 and 7.

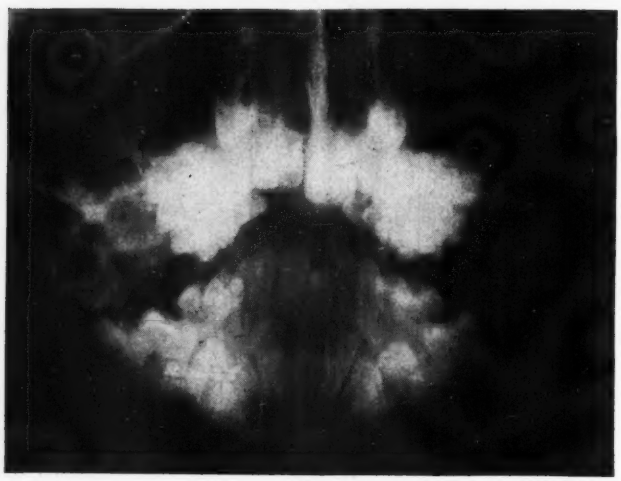


Fig. 8-*A*.

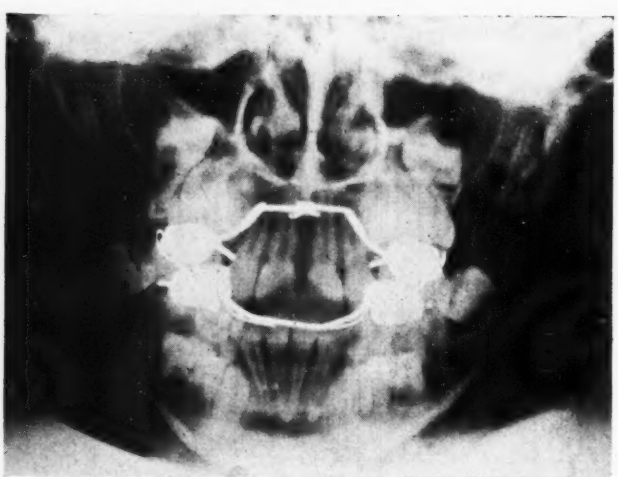


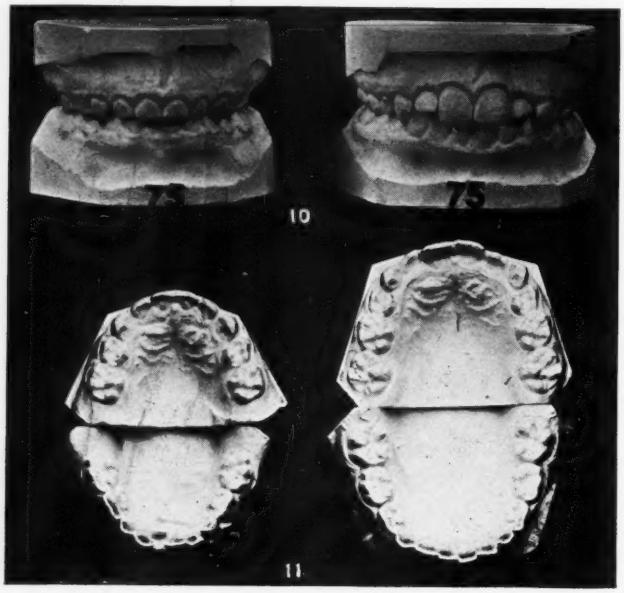
Fig. 8-*B*.

Fig. 9.

as used in the previous case shown, we find that the three deciduous teeth of this case measure 25 mm., the same measurement that we have already attained by another method of estimation. When the second impression was taken, the mandibular sliding device had been removed, and a lingual arch with auxiliary springs to round out the mandibular anterior teeth has been substituted. Here again, the first molars were well out in position. (The time taken for this expansion was about fourteen months. Then the mandibular lingual arch was placed.)

Here in Figure 8 (*A* and *B*) as in the other case you see the development that has taken place in the entire dental apparatus.

These small films in Figure 9 show the unfolding of the maxillary incisors, which have not been touched by the appliance.



Figs. 10 and 11.

Figure 10 shows another case in which the arches have been expanded in the same manner. The anterior teeth have not been touched. This patient was seven years old but was quite backward in her dentition. Expansion was accomplished in about one year, at the end of which time the appliances were removed and a mandibular retainer was placed. The retainer had only been off about one month when the second models were made, but I have watched the case since, and there has been no noticeable tendency to relapse.

Figure 11 shows how the first permanent molars have erupted to their correct width. This case was expanded about 5 mm.

I believe that such treatments as these should be done only before there has been much resorption of the roots of the deciduous side teeth; for if it is done after the roots are partially resorbed, we merely push the teeth through the soft tissues and get very little, if any, development of the surrounding bone.

650 Main Street.

DENTAL MODEL FINISHER OR GRINDER*

By C. H. Juvet, D.D.S., Ottawa, Canada

THIS model finishing machine as illustrated in Figs. 1, 2, and 3, is so designed that the maxillary and mandibular casts are finished with the casts in occlusal relation, thereby assuring all angles of the maxillary cast being parallel and continuous with the corresponding angles on the mandibular cast, and all angles being at right angles to the maxillary and mandibular cast.

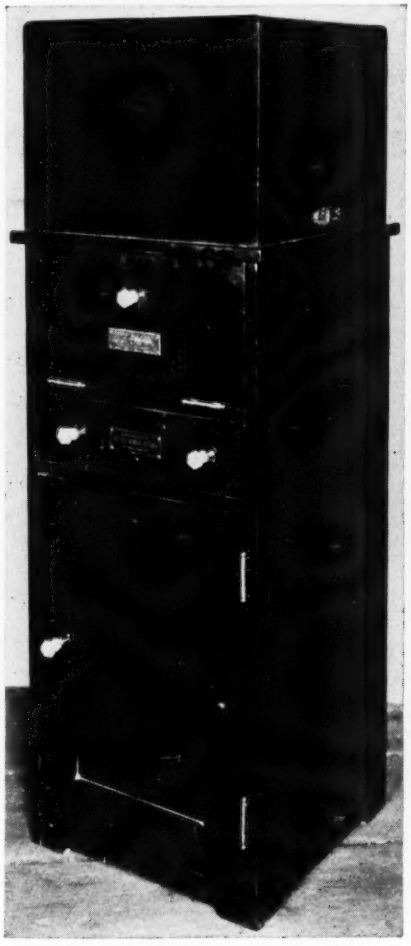


Fig. 1.

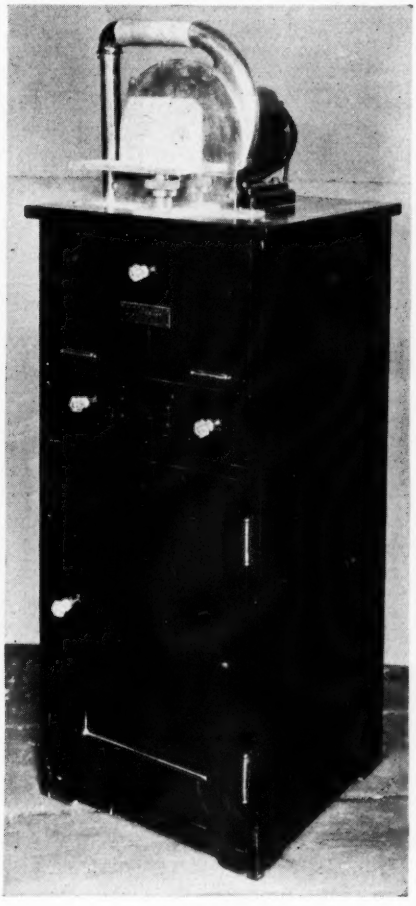


Fig. 2.

The casts being finished by an abrasive disk eliminate any danger of physical injury of any description to even the most incompetent operator.

The model finisher makes it possible to finish a set of casts in approximately twenty minutes, thereby eliminating one of the greatest time consumers of an orthodontic practice, and eliminating the accumulation of casts under course of preparation, which is characteristic of so many othodontists' offices.

*Clinic presented at meeting of American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

The casts are so readily finished that it makes it possible to finish study casts equally as well as those retained for record, adding very materially to the pleasure and comfort of the operator who has to study them.

The time occupied by those engaged in the laborious task of finishing casts can be more profitably employed, and in a great many instances this machine eliminates the necessity for so many assistants, thereby more than saving the original cost of the machine in less than six months.

The motor is equipped with an adapter which converts the machine into a standard lathe so that the standard tapered chucks can be used in the same

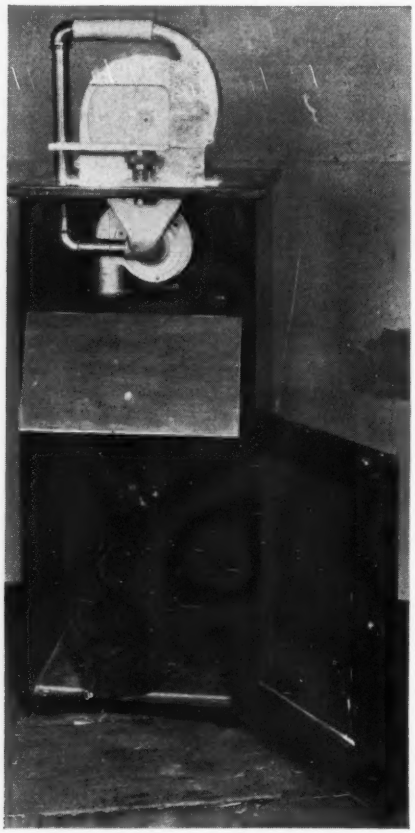


Fig. 3.

way and for the many purposes in which a dental lathe is used. The advantage of the table to rest the hands on when using the lathe is a feature which is entirely lacking in the ordinary lathe.

The machine is not one of the ordinary ill-fitting rattles which require constant attention. It is mechanically correct as to design and detail; every part of it is substantial, and it is finished with a degree of accuracy which a high class machine deserves.

The cabinet is made of birch in a mahogany finish. It is 17 inches by 15½ inches by 48 inches high and has suitable doors and drawers. The machine is a unit within itself, takes up very little room, is a very nice piece of furniture when closed and an indispensable accessory to the laboratory.

The finishing of plaster models or casts was heretofore mostly accomplished by shaping or cutting with a knife or steel blade of some kind, and finishing with a file. Plaster is of such a nature that cutting with a knife breaks the edges, therefore a large portion had to be left for the file to remove. One or two strokes of the file and the teeth on it became clogged, necessitating clean-

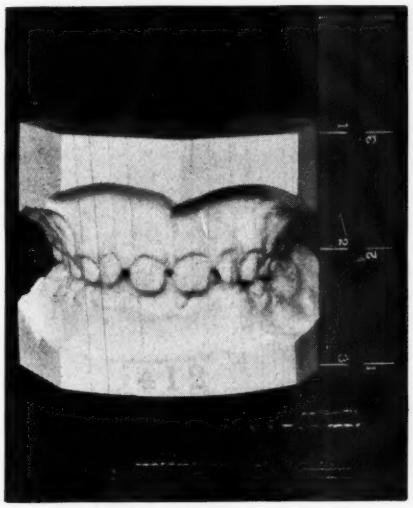


Fig. 4.

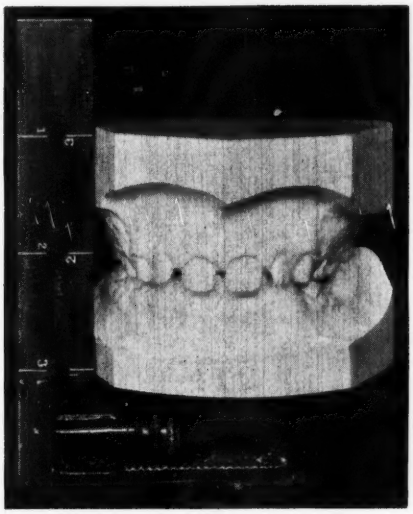


Fig. 5.

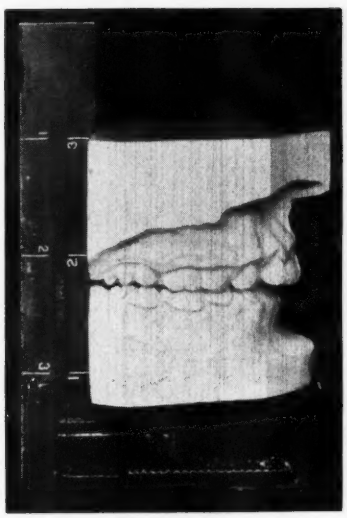


Fig. 6.

ing. This goes on for so many hours, and finally you have models that are neither square, parallel nor uniform, hence the idea was conceived that this work was a grinding proposition and not a cutting one, and the present machine, after many trials and changes is the outcome, and it does the work perfectly.

TECHNIC IN THE GRINDING OF MODELS

The back or heel of the mandibular model is first ground the required amount. The model is then placed on this ground portion and the art portion

ground to the required depth. The maxillary cast is then placed in occlusion with the mandibular and the heel of the maxillary ground until it corresponds with the mandibular. The backs or heels of the models are now placed against the adapter gauge which fits on the table and the one side ground at an angle of 70 degrees. The models are then reversed and the other side ground to a similar angle. The two small angles at the back are also ground at this time with the models still in occlusion. The maxillary cast is now placed on the table, and the art portion ground to the required depth, and you will find that when the models are again placed in occlusion, if a level is placed on the casts, they are practically level from every angle.

The angles on the front of the maxillary cast and the curved angle on the mandibular cast are now ground. The models are now ready to be finished with a file, which only takes a few minutes. The models are then rubbed over with talcum powder to fill the pores in the plaster, and they then present the appearance illustrated in Figs. 4, 5 and 6.

412 Jackson Building.

SECOND MOLAR ADJUSTMENT*

By William J. Speers, D.M.D., Boston, Mass.

THIS clinic is presented to show a simple yet efficient method of adjusting a second molar which is in buccal or lingual occlusion either in the maxilla or mandible.

Fig. 1 shows the two second molars of the mandible in lingual occlusion. The apparatus consists of molar bands on the first permanent molars to which is attached a lingual wire in order to have sufficient stability. At the distal end of the lingual wire is attached, as is shown in Fig. 2., a loop finger-spring extension to the second molar which can be easily adjusted by the removal of the lingual wire. This type may be used when the second molar is well erupted, while the one shown in Fig. 3 is used when the tooth is only partially erupted and consists of a perpendicular finger which may be carried below the gum margin having an occlusal rest.

Fig. 4 shows the occlusal view of the maxilla showing second molars in buccal occlusion. The molar bands and lingual wire are adjusted as in the case of the mandible, and to the buccal side of the molar band is attached a half round perpendicular tube. To this is attached a removable sectional appliance which is shown in Fig. 5.

60 Charlesgate West.

*Table Clinic Presented at the meeting of the American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

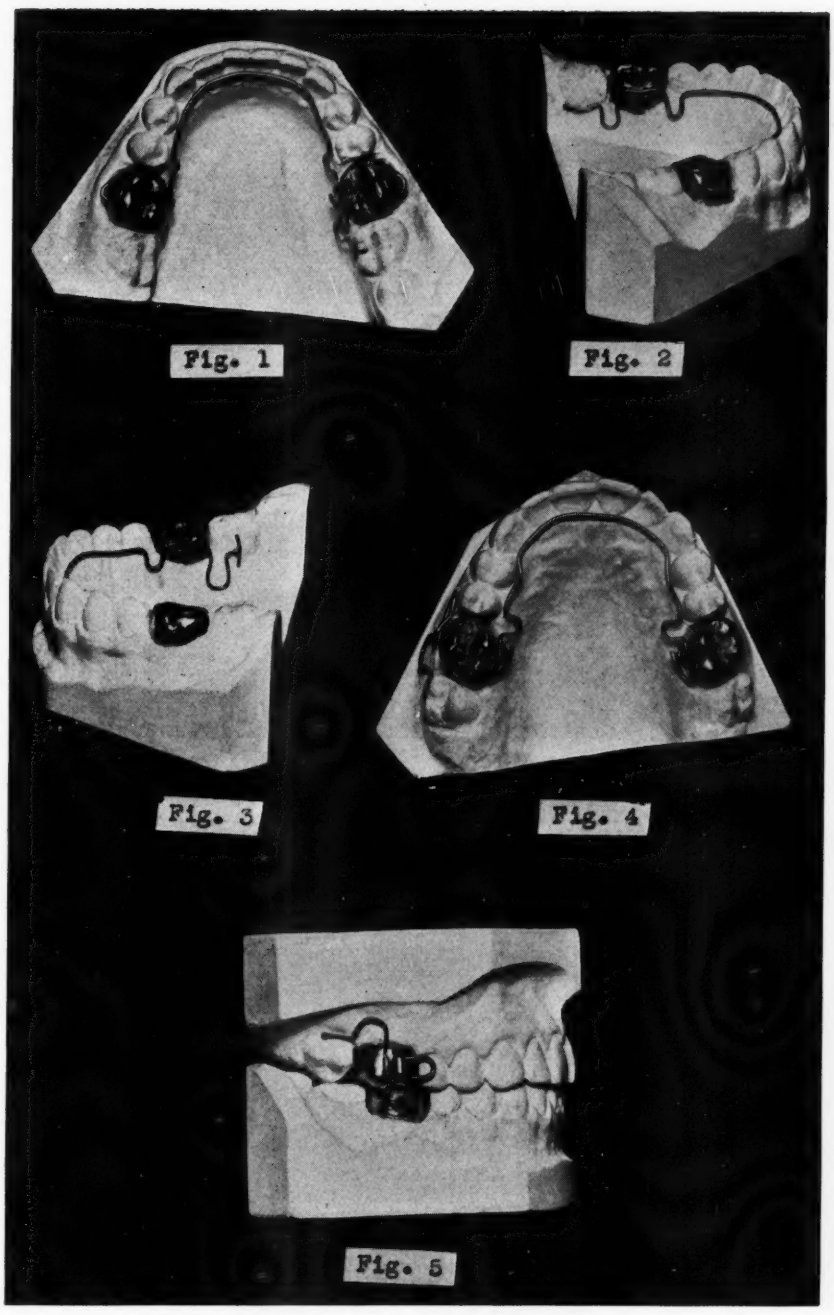


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

EXHIBITS SHOWING PROGRESS OF CASES INVOLVING SPACES CAUSED BY CONGENITAL ABSENCE, LOSS OF TEETH BY EXTRACTION, OR OTHERWISE*

By Hugh Grun Tanzey, Kansas City, Missouri

CASE 1.—L. B. Model No. 499. Complications at the age of seventeen years caused by the congenital absence of the maxillary lateral incisors.

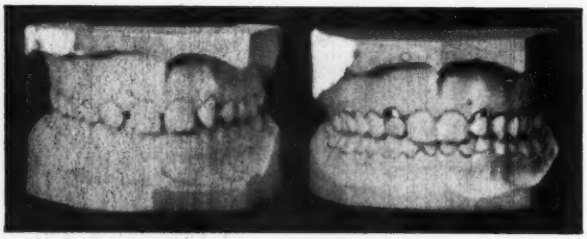


Fig. 1.—Shows before and after treatment covering a period of two years and five months which consisted of moving all maxillary teeth toward the median line and shaping canines by cutting away cusps and lingual surfaces. Also shows appliance which provided active post-operative maintenance. Teeth in both arches were treated.

Fig. 2.—Shows case before and after treatment which provided for the elimination of all third molars and the readjusting of all other teeth. This treatment including postoperative maintenance covered a period of three years.

Fig. 3.—Photograph of patient two years later shows no pronounced distortion which could be attributed to the sacrifice of the six teeth.

*Presented at the meeting of the American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

CASE 2.—M. J. U. Model 074. Patient, twenty-one years old, presented mutilations caused by the extraction (several years previously) of the maxillary left first premolar and the mandibular left lateral incisor in evidently heroic effort to effect improvement in the appearance of the teeth without treatment.

CASE 3.—R. S. Model No. 11. Patient was eight years old when treatment was first started. After five years of intermittent treatment and rest periods in which during the latter noticeable relapse occurred. The maxillary

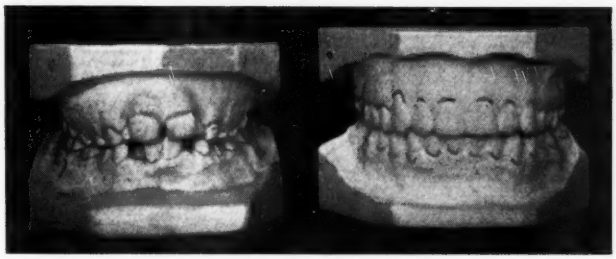


Fig. 4.

right and left first and mandibular right and left second molars were extracted. The mandibular third molars were abnormal in size and eruption impeded. Correction was effected by closing the space in the maxilla subsequent to extractions and by allowing the mandibular third molars to voluntarily erupt in the positions formerly occupied by the second molars. After extraction one and one-half years were necessary to complete the case as shown in Fig. 4.

TOWER BUILDING.

Montana State Board of Dental Examiners

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DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

PLANTATION OF TEETH

By Sterling V. Mead, D.D.S., Washington, D. C.

PLANTATION of teeth may be accomplished in any of the following methods:

1. Replantation is the reinsertion of a tooth into the socket from where it has been removed purposely or accidentally.

2. Transplantation is the insertion of a natural tooth from another mouth or another part of the same mouth into the socket of a tooth recently extracted.

3. Implantation is the insertion of an artificial or a natural tooth into a new socket.

The author does not feel that either transplantation or implantation is ever indicated or justifiable and does not recommend replantation as a routine practice but only in very exceptional cases. The results are to be considered very uncertain. When the age and health of the individual will permit, replantation of single-rooted teeth may be attempted under the following conditions, providing an artificial replacement by bridge or plate is not indicated:

(a) When a tooth is dislodged by trauma, accidentally extracted, or is practically exfoliated by traumatic occlusion;

(b) When the tooth has chronic periapical disease or extensive periodontoclasia.

Occasionally young children will have anterior teeth knocked out by some blow or fall, and the age of the individual is not suitable for proper replacement by bridge or prosthetic means. In these cases replantation should be considered.

The operation of replanting should follow the injury as soon as possible, but I have replaced teeth after the lapse of three or four days.

The roots of teeth without injury to the pericementum do not usually resorb. A replanted tooth may become ankylosed to its socket and become firmer than adjoining teeth.

FIXATION

Ligation is not satisfactory, as the tooth must be held in place by a metal splint.

Before the hour set for removal of the tooth, an impression of the tooth and adjoining teeth is taken. A splint is made of 35 gauge pure gold, and when the patient returns, it is burnished closely to the teeth. A small amount of 22 carat solder is flowed into each of the interdental depressions away from the incisal edge, both lingually and labially; this stiffens the splint. In some cases it is necessary to make the impression after the removal of the tooth. Instead of the swaged splint, bands may be made on adjoining teeth and on the tooth to be replaced (Fig. 10). A hole is made in the model and the tooth placed in it in proper position. The bands are then placed in position and soldered together. A cast splint as shown in Fig. 2 is very satisfactory.

TECHNIC

The mouth should be thoroughly cleaned and the field isolated, and the work should be done under as sterile conditions as possible. A small lancet should be run around the tooth to remove any attached gum. The tooth should be removed with a suitable forceps to prevent breaking. Novocain or nitrous oxide and oxygen should be used as indicated. The socket should be

Fig. 1.

curetted when indicated and a blood clot allowed to form. The tooth should be washed thoroughly in running water, placed in hydrogen peroxide solution and then in normal salt solution. The tooth may then be wrapped with half-inch gauze and the root canal cleaned with 60 per cent alcohol and filled with chloropercha and gutta-percha points. The opening into the pulp chamber on the lingual surface of the tooth is filled with oxychloride of zinc.

When the splint is completed, the gauze is removed from the tooth; and after the socket is irrigated and cleaned out, the tooth should be placed into it, and if necessary, the root may be cut off some. The splint is cemented to place and the case seen daily for prophylactic treatment.

REPORT OF A CASE

On September 25, 1923, Mrs. R., 41 years old, came to me for treatment. The upper right central incisor was so loose that it appeared ready to drop out. (Fig. 1.) It was elongated and showed the result of traumatic occlusion, and pus could be detected at the gingival border. All of the other teeth were vital, and there was no further evidence of periodontal or other pathology in the mouth. The teeth were short and the bite close, making a replacement difficult. There was a slight iritis of the right eye.

A modeling compound impression was made of the upper and lower teeth and a wax

mush bite made. A gold splint was then made. (Fig. 2.) I cleaned the mouth, isolated the tooth, and removed it under nitrous oxide and oxygen anesthesia in order to get a good blood clot. I did no curetting of socket. I then had the patient close the teeth on a piece of gauze for a few minutes until blood clot occurred and then left the wound alone.

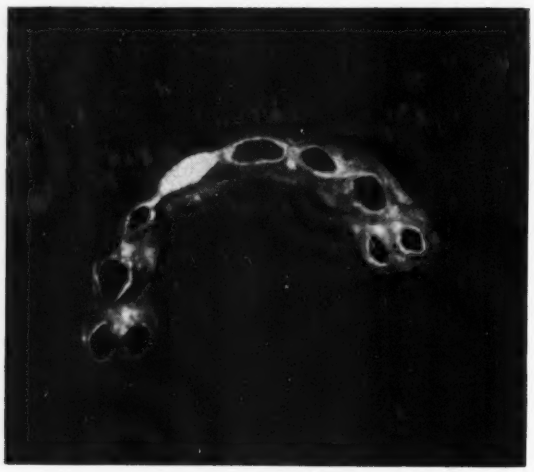
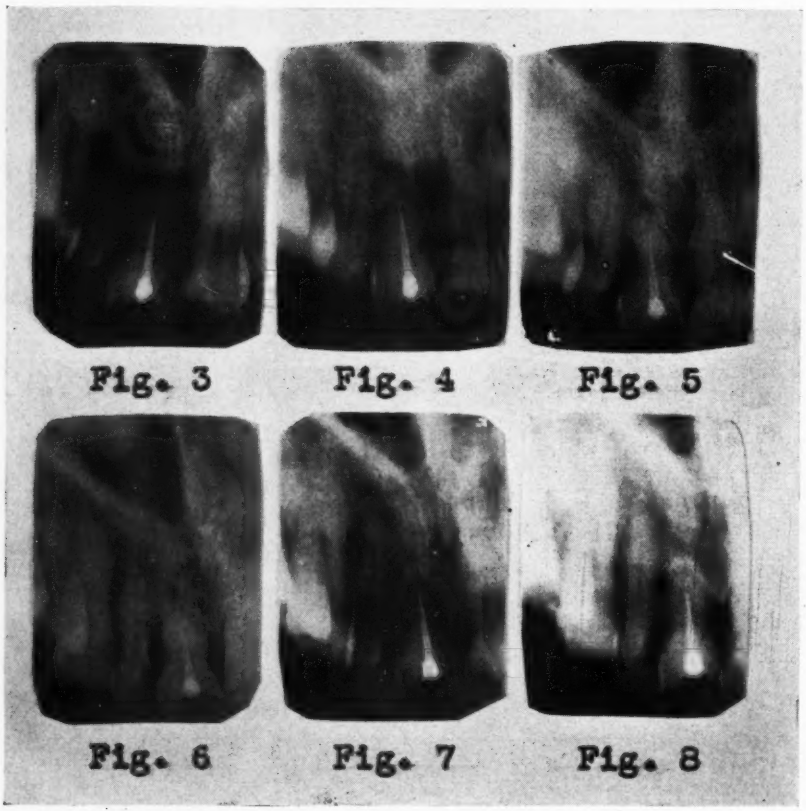


Fig. 2.



The tooth was washed thoroughly in running water and then placed in hydrogen peroxide solution and then in normal salt solution. The canal was then opened and cleaned with a 71 per cent alcohol solution and filled with rosin and gutta-percha points, and the opening into the canal on the lingual surface of the crown was filled with cement.

Fig. 9.

Fig. 10.

The incisal edge of the crown was ground down to correct the occlusion and prevent striking the tooth. The socket was cleaned out and the tooth inserted into it and the splint cemented to place.

Figures 3 to 8 inclusive show the progress of bone regeneration after replantation.

Fig. 3.—Sept. 27, 1923.
Fig. 4.—Feb. 13, 1924.
Fig. 5.—Nov. 30, 1925.
Fig. 6.—Feb. 16, 1927.
Fig. 7.—Jan. 10, 1928.
Fig. 8.—Aug. 7, 1928.

The roentgenograms are much clearer than the photographic prints and show complete bone regeneration around the apex. The tooth is held firmly in place and cannot be moved by manipulation.

Fig. 9 shows the clinical appearance. There has been no resorption of the root. Clinical examination discloses no periodontal lesion, and there is no movement of the tooth. Transillumination is negative, as the gum is very clear. The patient during this time has been well; the iritis disappeared promptly and has not returned. The following is a report from her physician regarding her present physical condition:

Personal History.—General Health is good. Infectious diseases were those of childhood. No gastrointestinal trouble.

Menses.—Began at age of fourteen years; periodicity was regular; duration of four days. Flow was free with no pain. Two children; one miscarriage; no leucorrhoea. Menopause was just over.

Physical Examination.—Temperature is 98.6°; pulse is 72; respiration is 18. Blood pressure is 158/80. General appearance is overweight. Head and neck are O. K. Heart has accentuation of second pulmonic sound. Lungs are negative. Abdomen is negative.

Laboratory Findings.—Urine is light yellow in color. Reaction is acid. Sp. Gr. is 1012. No albumin. No Sugar. Microscopical test negative. Blood: R.B.C., 4550,000; W.B.C., 7000; Hg, 84 per cent. Coagulation time, 3 minutes.

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CONCERNING OSTEOMYELITIS OF THE JAWS AND ITS CONNECTION WITH THE DENTAL SYSTEM*

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IF WE wish to follow von Perthe's classification in speaking of the forms of osteomyelitis which arise from carious teeth and gangrenous pulps of non-carious teeth, we should consider these diseases together, as the course is the same in anatomic relationship and differs in this gangrene of the lateral portions of the bone marrow only by the intensity of the pathologic picture which is complicated by a mixed infection with anaerobes. As is generally understood, the infection takes its course through the carious process to the pulp and then to the peridental membrane, or the pulp may become infected and decomposed without the presence of an active carious process, due to mechanical or chemical injuries, which sets up an infection in the peridental membrane. The fact that there is no communication with the oral cavity complicates the process as the putrescent gases cannot escape. These cases of putrescent pulps which are left untreated may cause grave inflammatory processes in the peridental membrane. Hyperemia and exudation occur which can be taken care of by treatment, otherwise the process will take another course. The factors to be given consideration are the possibility of drainage through the pulp canal or along the peridental membrane to the neck of the tooth, the virulence of organisms and the resistance of the individual to the infection. The surrounding bone becomes involved, and either acute or chronic inflammatory changes of the jaw bone are evidenced around the root. At present in the literature the condition is called a periodontitis as long as it remains local, but as soon as the jaw bone becomes involved, the process is no longer a disease of periodontal nature but an osteomyelitis in the broader sense of the word if we understand under this heading an inflammatory condition of the entire bony tissue and consider especially the pathologico-anatomic picture.

The way the infection progresses is through the vessels of the peridental membrane to those of the bone, as there is a rich communication between the vessels of those two structures. Soon the neighboring marrow spaces become filled with pus and even the Haversian canals are widened through this inflammation of the marrow spaces. In a description of the acute form of the disease the following course is found in most cases: the serous fluid in the peridental membrane soon undergoes a suppurative change, and a partial decomposition of the alveolar process and involvement of the spongiosa and its marrow spaces follow quickly. In the external cortical layer the periosteum is lifted up and a subperiosteal abscess forms which finally penetrates the

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periosteum and becomes a subgingival abscess. In this stage there is some swelling of the surrounding soft tissues with the formation of the so-called gum boil.

When drainage is established into the oral cavity, the opening is called a gingival fistula; and when drainage takes place through the skin, a facial fistula is formed, this condition arises more often in the chronic type of the disease. Happily, the process in most cases remains locally walled off, and if the possibility of adequate drainage is evidenced during the acute symptoms and drainage is established quickly, generally the disease takes a favorable course. This is the reason why the term osteomyelitis is avoided for these diseases and reserved for the more severe pathologic process of the bone marrow. Sometimes the process does not run such a favorable course. Then it does not remain localized as before but undergoes a diffuse extension within the bone and causes a more or less extensive necrosis of the jaw following the suppurative inflammation which is comparable to that set up by hematogenous infections. According to my observation, as well as that of others, these odontogenous cases of osteomyelitis, even the traumatic types following septic extractions or oral surgical procedures, are more common in the mandible than in the superior maxilla. In our opinion the mandibular canal and its contents play a great rôle. In severe cases we have always observed that a penetration from the alveolus into the canal occurred and then a rapid diffusion along the canal, often over the entire half of the mandible and the ascending ramus.

Why some cases beginning with the same intensity of symptoms sometimes run a relatively harmless course, while other cases lead to life-threatening appearances, can hardly be explained fully. Aside from the above mentioned factors, the virulence of the invading organisms and the resistance of the patient play a great part and, unfortunately, also improper treatment as well. The intensity of the disease is clinically observable by a considerable rise in temperature and a boring, pulling pain in the affected region of the jaw. A few days after the beginning of the bone involvement a loosening of the adjacent teeth takes place which may progress to the point where they are lost spontaneously. Meanwhile, the pain becomes pulsating, and abscess and fistula formations take place with severe swelling of the soft tissues. After weeks more or less large sequestra separate, and spontaneous fractures may take place with partial or total necrosis of the jaw. This happens more often in the mandible where the infection can spread along the canal to include the ascending ramus. In this stage the disease often progresses to a peri- and retromaxillary phlegmon, which is a very serious complication, or to a suppurative venous thrombosis from which a pyemia may develop. The following cases are cited as explanations of some of these factors.

W. K., 38 years old. Previous root canal treatment of the lower left first and second bicuspids. Periodontitis on the second bicuspid, which was extracted the day afterward under general anesthesia because of swelling on the left side of the face. A small amount of pus was present. The tooth had a very small, long root. The following day there was more pounding pain. Upon opening the alveolus, rich pus was evacuated. In spite of treatment, the patient returned the second day with high fever and extreme malaise. There was indurated swelling of the cervical regions also. The mandibular left central, lateral, cuspid and first bicuspid were loose and sensitive. Pain in the jaw. Some

trismus. Repeated opening of the alveolus of the second bicuspid brought forth some pus. The second day afterward, the general symptoms became worse, and high fever was present. Extraction of the mandibular left central, lateral, cuspid and first bicuspid brought forth some pus from the alveoli. An incision was made in the floor of the mouth and at the angle of the mandible. The next day the swelling went down without improvement of the general symptoms. Death occurred in two days due to septic pneumonia.

Postmortem Findings.—Foul suppurative osteomyelitis of the mandible from suppurative periodontitis of the mandibular left premolars with extension into the mandibular canal. Suppurative periostitis in the entire left side of the mandible; suppurative phlegmon with thrombophlebitis in the tissues surrounding the angle of the mandible. Thrombosis of the common facial vein with suppurative destruction of the thrombus causing an extension into the internal jugular vein.

Many metastatic abscesses in both lungs with a serofibrinous pleuritis on both sides.
Serofibrinous pericarditis.
Inflammatory endocarditis. Mitral valve.
Suppurative bronchitis.
Inflammatory swelling of the spleen.
New cirrhosis of the liver.
(Septic pyemia.)

This case shows that we are very often powerless in controlling the infection and that it is often better to extract one or more teeth to prevent extension into the mandibular canal.

Sch. R., 35 years old. Painful reaction to cold in the maxillary right first bicuspid seven weeks before. Treatment resulted in swelling of the right half of the face. Four weeks later the tooth was extracted. Some days later opening of a tooth abscess. Since then a thickening of the cheek, pain, drainage of pus from the alveolus, edema of the lower eyelid and soft tissue inflammation. The teeth from the maxillary right central to second bicuspid inclusive were loose and painful to percussion.

X-ray examination revealed diffuse destruction, especially pronounced in the region of the first bicuspid and lateral. Upon opening, drops of pus exuded everywhere from the spongiosa. The main mass in the region of the first bicuspid reached behind the cuspid, which was in buccal version. Extraction of the lateral, evacuation of pus and porous bone. Later the separation of a sequestrum. Healed four weeks after operation.

Very seldom do these diseases of the teeth lead to all these previously described pathologic pictures in the jaw; much oftener there are only subacute and chronic changes brought about. As the chronic type of osteomyelitis also deals with a transmission from the tooth to the jaw bone, it should also be described. It is primarily a disease process of low grade. To this class belongs chronic periodontitis, apical or diffuse, granulomatous or purulent, with or without fistulas, or with a penetration to the exterior as with chronic exudative periodontitis. It is not my purpose to describe all these conditions singly but it should be brought about that we are not dealing any more with a disease of the peridental membrane but with one which is affecting the adjacent bone. In a clinical sense, these processes are usually harmless and run a course which is not particularly disagreeable, but it is not recognized often enough that cryptic masses may be present from which serious systemic diseases may take place. The infection then becomes hematogenous. Conversely we have noticed that systemic ailments such as la grippe may cause these dormant masses to flare up acutely.

The inflammatory changes extending from chronic peridental membrane diseases have led us into the realm of subacute and chronic osteomyelitis. In considering this disease more closely we must make it clear that it can result either from an acute osteomyelitis or appear primarily as an independent disease. We now wish to bring to you the changes in the periosteum, to mention a characteristic disease change, the so-called periostitis albuminosa or serosa. Poncet described such a condition in 1874 which shows under and between the layers of the periosteum an accumulation of clear, sticky, thread-like, egg white exudation. The periosteum is raised from the underlying structures, thickened and covered on the inner surface with a fatty granulation. Schlang considers these changes only as evidence of a degenerative process of suppurative periostitis and sees nothing in them other than a gradual change. Clinically the process can begin gradually, yet a rise in temperature and swelling of the affected region may appear. A fluctuating mass may slowly arise, and upon excision, against expectation, the slimy, serous exudative fluid is found. The periosteum is often found as a thick fibrous wall and often changed into a glassy, jelly-like mass under the layers of the changed soft tissues. There are also cases of this primary periosteal involvement where the bone is involved to the point where there are free masses of it, erosion is present, and openings may be seen penetrating into it. Still deeper one comes to the golden fatty granulation and sequestration. Payr conceives that we are dealing with a secondarily serous degeneration of a subperiosteal abscess in this form of periostitis albuminosa.

This shows the narrow connection between bone and periosteal disease. Chronic inflammations of bone tissue itself show two changes, either atrophy, or resorption, or new bone formation; often both processes are to be seen together. Kaufmann classifies three forms of chronic osteomyelitis. The first has the appearance of a rarefying osteitis or inflammatory osteoporosis. In this form the marrow becomes changed into a vascular granulation tissue which, by lacunar resorption, leads to a destruction of the bone structure and Haversian canals, the latter become widened into cavities. On the opposite side perforating canals join the single spaces together and make the bone porous and rarefied. The entire process in the bone goes on without suppuration and for that reason assumes the appearance of a dry granulomatous form of osteomyelitis. The second type of chronic, inflammatory bone disease he places together under the name of caries of bone which he understands as a chronic intraosteal granulation growth with loss of bone. We are then dealing with an ulceration of bone tissue through interstitial granulation formation which leads to a permanent destruction of the bone tissue and cavity formation. Usually the process shows pus formation and putrefaction, but this may also be absent. The bone tissue remains completely passive, and the destructive process has the power to extend through the active growth potentialities of the granulation tissue. Between the granulomatous inflammatory products often little dead particles of bone appear which have formed due to a lack of nutrition. Volkmann names this process molecular necrosis, in which the particles are either decalcified or may contain some calcareous material and appear as bone sand. By the process of putrefaction the bone often takes on a dirty color and becomes so porous and carious that it can be cut with a knife.

H. J., 20 years old. Painless swelling over the entire right side of the face. Gingival irritation in the upper right jaw with many fistulas. On pressure blood tinged pus was expressed. The investing structures of the teeth from the maxillary right central to second molar inclusive were badly affected and held in place only by the soft tissues. Extraction of these roots. Incision and separation of the destroyed porous bone tissue and granulations, however, without leaving an opening into the oral cavity. After the separation of the sequestrum, the healing process took place.

As the third form, Kaufmann names the osteosclerosis or ossifying osteitis. In contradistinction to the other two forms where the rarefying changes are in the foreground of the process; in this type the changes are mainly proliferative, which have been manifestly called forth by the chronic inflammatory stimulus. In this type there is a growth of osteoid tissue on the bone trabeculae at the expense of the bone marrow and vessel spaces. By intensive bone formation it shows the excessive building of extending compact masses of ivory hardness which can only be cut with a mallet and chisel and then with difficulty. This is called sclerosis or eburnation. This bone hard product is caused by the endosteum which develops the power of excessive bone development.

We can see all the above described chronic inflammatory changes in the jaws. The periosteal condition which we have learned as periostitis albu-

Fig. 6.

minosa or serosa is evidenced especially by a compact, calloused and thickened proliferation and is almost always concomitant with processes inside the bone which have been caused by chronic alveolar disease. This proliferation is often so compact and adherent that one may get the impression of a bony tumor on palpation.

D. E. gave history of swelling for four years in the region of the mandibular right first and second molars. Incision and removal of a root and a round stony structure the size of a pea. Improvement but a continuation of an obvious thickening. Absent for three months. Ten days later, renewed swelling appeared. Incision and drainage of pus. After that a suppurative exudation. Five days later, renewed swelling. The patient presented a diffuse painful swelling the size of a hen's egg. Under it was plainly seen a hard swelling the size of a walnut. The process also had a lingual extension.

The x-ray showed an intensive thickening of the structure distally from the first bicuspid to the third molar the size of a walnut. Within this structure was an irregularly bounded area with lines of indistinct interlacing structure.

Upon surgical opening there was an inflammatory periosteal proliferation in the bone, a cavity somewhat larger than a marble filled with soft granulation tissue and sequestra. Deeper a granulomatous mass the size of a cherry which showed a connection with the exterior (see Figure 6). After complete curettage, healing took place.

The so-called rarefying osteitis, respectively osteomyelitis of the jaw bone, is characterized mostly by subacute or chronic and often minimal bone abscesses which are caused by chronic disease of the side of the tooth and peridental membrane. Often an acute incipience with a circumscribed swelling and a rise in temperature may be evident, but the disease may lie dormant for ten years. In the meantime there may have been acute remissions which may have appeared as painful inflammatory swellings produced usually by general systemic disorders. The complaint is usually evidenced by an acute boring pain which many times may last for weeks. There may also be suppurative exudation. Within the jaw bone we often find more or less small sequestra and in their surrounding tissue carious poorly calcified osteoporosis which can be easily removed with a scalpel. A golden, slimy-serous, foul exudate may often be found. Great cavities appear within the bone which remind one

Fig. 7.

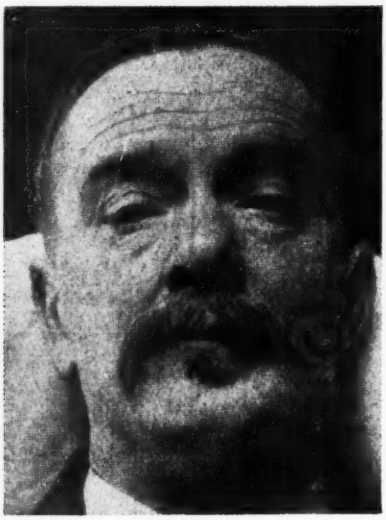

Fig. 8.

of cysts without the epithelial lining. Between the softened bone trabeculae are found masses of vascular granulation tissue.

F. H., 55 years old. A fistula from the mandibular left first molar region at the age of 8 years. Later a completely painless slow thickening on the left side of the mandible which grew from cherry size to the size of a hen's egg from the age of 14 to 20 years and since then has changed very little. Exempt from military service because of the swelling. The patient shows from the symphysis of the mandible distally a hard, regular round protuberance the size of an apple and within the mouth an eminence lingually the size of a hen's egg. He complains of a bad taste and pulsating pain in the region of the lateral and cuspid. Extraction of these teeth resulted in the drainage of gray-gold, bloody, foul-smelling pus. Deeper structures evidenced profuse suppuration. The x-rays show a diffuse area in the region of all the front teeth and many diffuse areas everywhere in the affected bone structure. The teeth loosened, and extraction was done from the mandibular right central to the mandibular left second bicuspid. Excision of the upper part of the alveolar ridge in one piece. In one area a granulomatous suppurative process appeared and in another a round mass of destroyed bone larger than a walnut. The mandibular canal was displaced buccally and was open. Distally the stump of the nerve was evident; mesially in the region of the anterior teeth there was a suppurative

mass with the same contents as the one already mentioned. Packing placed after thorough curettage. Later two fluctuating swellings which contained pus and from which sequestra separated. Pathologic findings: in some small pieces of soft tissue there was inflammatory infiltration of a nonspecific nature with new blood vessel formation; no tumor formation present; in single areas necrotic bone; chronic osteomyelitis.

While in the mandible this central softening is a limited process, on the contrary there may often be observed periosteal bone formation by osteophytes which appear to be unnoticed in the maxillary jaw. Here the rarefaction and softening are mostly more diffuse, and the periosteal bone production is in the background.

It appears to me that osteosclerosis occurs less often in the jaws than in the rest of the bony skeleton. In its course in the jaws it shows no noteworthy variations. I shall not go into the rare degenerative bone changes such as osteitis deformans, leontiasis ossa, etc. However, I will describe briefly the case of a mother-of-pearl dresser with an osteomyelitis of the entire mandible.

R. L., 23 years old. Beginning of the disease dating back some time. Treated many times but not operated on even though it was his wish that such a procedure should be carried out. He was advised to have an operation and radiation here. The entire mandibular jaw gives the impression of a plump deformity. The soft tissues relatively normal. Pro-

Fig. 9.

nounced glandular enlargement, the neck infiltrated and indurated. The swelling is hard as bone and arises from periosteal activity. Trismus of the second degree. In the mouth is evident, dark-bluish, inflamed, hyperemic, mucous membrane. All teeth very loose, fistula formation and suppuration from the alveolar process.

The x-ray picture shows the entire mandible affected by osteomyelitic areas and destroyed bone substance. As we would not operate, the patient left without treatment.

It is apropos to describe the bacteriologic side in connection with an understanding of osteomyelitis. By far the most common organism to be found in bone marrow diseases is the Staphylococcus pyogenes aureus, and many authors wish to apply the term osteomyelitis only when this organism can be shown. If we look on the clinical forms and the pathologico-anatomic changes as the standard for the name of a disease, we are making a mistake. A staphylococcal infection in bone usually presents a serious picture. One can speak of a known predisposition of bone during the period of growth. At this time the bone is in a state of physiologic activity or irritation which shows a susceptibility to hematogenous staphylococcal infections leading to osteomyelitis. The inception of the disease is dependent upon the virulence of the invader and the resistance of the host as well as upon the quantity of growing

bacteria in the body fluids. The longer the blood controls the flood of bacteria, the more difficult it will be for the disease to take place. Garre was the first, in 1883, to culture staphylococci from the blood stream in a case of osteomyelitis. Since then cultures have been made with positive results. Osteomyelitic diseases have also been produced by experimental inoculation with staphylococci. The Staphylococcus pyogenes aureus possesses decidedly a certain propensity for the formation of central bone abscesses, necrosis and sequestrum formation. As a further invader, the Staphylococcus albus is considered next in importance. This organism was first shown alone in osteomyelitic pus by Rosenbach. Clinically there is very little difference in the severity and course in the conditions caused by the two types of staphylococci. The pathologico-anatomic changes in the bone are also similarly evidenced. Lannelongue found the Staphylococcus albus present in less than one-fifth the number of cases in which the Staphylococcus pyogenes aureus was evidenced. The streptococcus is considered the next dangerous invader. It appears that the disease begins with extremely severe general symptoms, and the suppurative process extends more quickly and widely, but the bone as a rule is affected far less than in the staphylococcic infection. When sequestra are formed, only the cortical layer of the bone is usually affected. The pus is different from that found in the staphylococcic infection in that it is thinner and of a bright green color. The streptococci appear to have more of a propensity of attacking the joints than the bone. An infection caused by pneumococci behaves very similarly to one caused by the streptococcus. According to past observations, this type of infection runs a more favorable course, the bone destruction extending less. Yet osteomyelitis caused exclusively by the pneumococcus is often disputed. On the contrary, it is generally accepted that the typhoid bacillus can be the single factor in the development of suppurative bone diseases appearing as a consequence of typhoid. To be sure, some authors maintain that this reddish-gold, thin and almost acellular pus is only a regressive metamorphosis of pathologic cell changes. The bone affections occur approximately the fifth week of illness, also at a time when the body resistance has been greatly taxed by the long intensive disease. The bone changes are multilocular. Usually only small areas are affected and especially the cortical portion and periosteum, while the marrow shows only a rather severe hyperemia. Doubtless the typhoid bacillus possesses no especial characteristic of settling in bone marrow and does not cause the great amount of destruction in the area that the staphylococcus does, but the disease is so obstinate and protracted because the body resistance is appreciably diminished by the exhausting weeks of illness and because of the broken down state of the body. The specificity of influenza in some cases of osteomyelitis is very often doubted, but some cases are seen which appear to have been caused by this condition. No special symptoms are noticed in this type of osteomyelitis. Mixed infections from general diseases cause more osteomyelitis than specific invasions such as typhoid, paratyphoid or influenza. Here teeth with diseased roots with symptomless periapical infected areas play a large rôle. These places are areas of lowered resistance from which an osteomyelitic process may begin. We find streptococci mixed with specific organisms in these places. Most often we have been

able to observe exacerbations of these areas in cases of influenza which can lead to an osteomyelitis of the most severe type. The same occurrence can be seen to develop when there is a suppurative infection any place in the body caused by staphylococci. An old root area can also primarily develop into an osteomyelitis which runs a most severe course, for a mixed infection of staphylococci and streptococci may cause rapidly progressing necrosis with very severe clinical symptoms.

In the last few years the treatment of osteomyelitis has been the center of much interest. If one has previously been disposed to radical surgical procedures, new things appear here in favor of a more conservative and observational treatment. The evidence in this question has been procured by an inquiry by Rost from individual German clinics as to their treatment procedures of acute osteomyelitis, especially in the stage of subperiosteal abscess formation. It showed that ideas varied greatly; a large part favored wide opening of the bone marrow, others did this only seldom when pus exuded from the Haversian canals or the temperature did not go down in spite of incision of the abscess. Others mainly favored incision of the abscess and have discarded supplementary trephining. Rost has now considered the material at the Heidelberg Clinic and has been able to show some interesting comparisons. At this clinic Wilms confines himself to incision only, while his colleague, Enderlin, chisels widely. Rost showed that the mortality was less in those cases that were not operated radically with bone removal than in those where that procedure was carried out and that complications occurred doubly in the latter cases. Brandt has also come to the same conclusion, and both of them are under the impression that through bone surgery at this stage healthy bone marrow spaces are opened and the infection is secondarily spread to these healthy areas. Many publications have appeared which deal with the question of treatment of acute osteomyelitis in which new grounds for or against radical procedures are brought forth. New treatment methods, which are so detailed that it is impossible to treat of them here, are given in favor of both sides. Beust favors vaccine therapy, Makai the autotherapy, Ritter recommends repeated punctures of the subperiosteal abscess, Payr and others trephine the bone in several places. Those on the radical side are not satisfied with the simple exposure of bone and its eventual separation, but also bone transplants are resorted to as reparations for the defects caused by subperiosteal resection. These differences in the treatment methods are unfortunate as they undoubtedly cause confusion. We must be clear in saying that osteomyelitis shows in its nature such a variety of severe disease processes that there is some basis for different methods of treatment of these various manifestations. We are not yet clear about the basic questions as to the etiology and pathologic-anatomic aspects. According to Lexer, end arteries are to be looked upon as favorable factors for the origin of osteomyelitis. This has been shown on the margins of the epiphyses of young humans. Also the researches of Ochsner and Crile are of importance in this connection. They showed that the bone canals through which the blood vessels run are narrowed directly under the periosteum and their lumina are enlarged five times toward the marrow spaces. If infectious material is spread through the blood stream, it is easy to conceive that emboli

may be found within the primary osteomyelitic mass in the outer corticular layers. This rather speaks against the removal of bone. The question has also been discussed very often recently as to whether the suppuration results primarily from a hematogenous infection and then the bone necrosis follows or whether the process runs conversely. While it has been generally accepted since Lexer's basic work that the suppurative change is the first, Ritter sought to present new ideas, namely, that the suppuration is only a consequence of a nutritional disturbance brought about by infected emboli resulting in bone necrosis. It is clear that by taking this standpoint Ritter discards the surgical removal of bone, especially as it is impossible to ascertain how much of the bone will undergo necrosis. On the contrary, it is to be considered that by not opening the marrow space we trangress against the time-honored surgical basic statement, "where there is pus, incise," and so the pus under pressure and the bacteria are given an opportunity to extend further. This brings up the question as to whether or not in the given case there is already a suppurative destruction in the marrow spaces. One can establish this by incision of the abscess, as remarked previously, and the exuding of pus from the Haversian canals. It must be recognized that the pus arising from the bone marrow is rich in fat droplets which originate from the fatty content of the marrow. However, this symptom as well as other more commonly known symptoms may not be evident in light cases. The x-ray in the beginning of the disease gives us no clear information but later shows the loss of the trabeculae of the spongiosa and also, perhaps new bone formation by the periosteum. As Hedri has shown by clinical researches and also experimentally, from inflammation in bone marrow fat is liquefied and can get into the circulation through the veins. Part of the fat is saponified by the alkaline blood serum, a part is taken up by the endothelium of the blood vessels and the rest admitted into the general circulation in the lungs. This is excreted in the urine and can be shown by tests. Hedri obtained positive fat findings in acute cases and in those with subperiosteal abscess formation when the suppuration in the marrow was under high pressure; when the pressure was slight, no fat was shown in the urine. Hedri says that this finding may be used as an indicator as to when to go into the bone and when not to. Hedri's researches certainly are of importance, although it must be said that in acute cases and those with subperiosteal abscess formation the necessary conclusions are to be drawn from the exudation of fat containing pus out of the Haversian canals.

The question as to when and how osteomyelitis is to be treated was studied during 1925 in the German and Russian societies for surgical study with disagreements here and there on certain points. For every view a basis and contradiction could be produced. That situation originated from the nature of the disease. We can find all variations in the different severities of the cases. The type and virulence of the invading organisms are not always the same; likewise the body resistance often varies, and thereby the clinical picture varies. For this reason we should, in my opinion, not make the question as to whether or not to go into the bone marrow the paramount one, but to decide by consideration of the previously discussed problems from case to case which therapy appears to be the most applicable. The process in osteomyelitis

in the jaws is somewhat different from the cases studied, which were from the long bones. In the jaws we do not have marrow cylinders but only the spongy bone spaces filled with marrow and the adjacent spaces in very close relationship through their thin walls in the maxillary jaw and in the mandible through the mandibular canal, but the most important factor is that the condition of the teeth and pulps are important etiologic factors. It has been shown from previous descriptions that the process may vary with the individual case. The art of treatment is in selecting the proper treatment for the individual cases, which corresponds to no set and fast rule. It can be said that in serious cases where there is a tendency to diffuse extension, especially in the mandible through the mandibular canal, an extensive opening appears necessary. In the maxillary jaw, in such cases, it is not best to wait too long, as there may be a penetration into the antrum which necessitates protracted treatment. Often one or more spontaneous fractures occur in the mandible which make it necessary to resort to the application of dental splints. If the fracture occurs in the ascending ramus, there is a very pronounced dislocation due to the fact that the internal pterygoid and masseter muscles are inserted there. In severe cases the disease may lead to partial or total necrosis which necessitates the use of plastic surgery or prosthetic appliances. In the majority of cases the operative cases can be done intraorally and almost always under conduction of local anesthesia and never narcosis, as we can usually carry out procedures in the mouth with perfect satisfaction with local anesthesia and do not have to worry about the dangers of narcosis. Evacuation of pus is necessary, and sometimes there must be the establishment of a combined inner and outer drainage.

Ideas vary greatly as to what influences the regeneration of bone lost in osteomyelitis. The greatest part of new bone formation surely is brought about by the periosteum. Whether the bone marrow or endosteum plays a decisive rôle in the regenerative change is still a moot question. Bier and his school think that marrow is necessary for the process to take place; Enderlen and others do not hold the marrow an absolute necessity for regeneration. It is claimed that marrow is mainly important for natural bone formation and not regeneration. It was Roux who first showed the importance of the static-functional force and its influence on bone formation and regeneration. Not only is a strong stimulus given to the bone regeneration, but also particular influences are given which have to do with the form and structure of the bone. This knowledge is being used now in solutions of the continuity of bone with success, as we have in the dental splints, with or without intermaxillary force, the possibility of fixation which also allows functional movement. It has been shown that a stimulus is given to the dead seqestrum from the new bone formation which keeps it from separating too soon. It is also maintained that in the dissolution of bone the osteoblasts utilize the released calcium salts in regeneration.

Finally we want to consider in this connection the retention of teeth in osteomyelitis of the jaws. According to the grade in which the disease advances diffusely in the jaw and the suppuration and necrosis are revealed, we can see a loosening of the teeth in the affected area. Fistulas or exudation of

pus from the gingival crevice and the teeth appearing to be held in place by the soft tissues so that one could easily extract them with the fingers are situations which very often appear. Often a spontaneous exfoliation takes place. This can be observed in childhood age especially often when not only the deciduous teeth but the permanent teeth exfoliate. One is tempted too easily, because of the extent of the disease, to extract the teeth because of the existence of the profuse suppuration as well as the exaggerated loosening. But the observation has been made that even greatly loosened teeth become tight again with the healing of the disease and can function well; even in cases where one is sure that a death of the pulp has taken place, the tooth not only regains its natural appearance and percussion reaction but also its vitality as well. Without admitting the trueness of the still unsettled question as to the regenerative power of the tooth tissue, especially the pulp, and the connected research findings, the fact must be recognized that greatly loosened teeth do have the power to tighten and regain function from the application of therapeutic measures. For that reason a great many authors advance the opinion that extraction of very loose teeth should not be done in cases of osteomyelitis. Others demand in a case of dental origin the extraction of the guilty teeth in all cases, but all other loose teeth are to be retained. Stein is of the opinion that the teeth are to be extracted when they show no tendency of tightening, as to the others, he comes to the conclusion "that one needs in no way lay such stress on the preservation of teeth in osteomyelitis." The primary goal in treatment must be only the quickest healing of the jaw bone with the least amount of destruction of it; a subordinate wish of this principle is the retention of teeth. As has been shown throughout, there is great variation in single forms of osteomyelitis according to the localization, limitation and above all the intensity of the infection and the resistance of the individual. For this reason I think one should make no set rule as to when teeth should be extracted, but the decision should be made according to the progress of the case. We must always consider the knowledge, gained by experience, that greatly loosened teeth will, against expectation, tighten again. If sufficient drainage of pus is possible and there is no existence of danger of extension and increase in the severity of the disease because of the retention of loose teeth, then one remembers the possibility of them tightening and leaves them in place; in other cases the sacrifice of one or more teeth is to be considered as the lesser evil.

MAXILLOFACIAL PROSTHESIS*

Extraoral Prostheses

By Roy L. Bodine, D.D.S., Washington, D. C.
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(*Concluded from page 267, March issue.*)

IN THIS age of plastic surgery, artificial restorations of parts of the face are much less frequently necessary than in former years. Most of the injuries which are commonly encountered can be best handled by surgical repair rather than by prosthesis.

There are, however, some cases which are still beyond the possibilities of plastic surgery or which present such difficulties as to contraindicate operative measures. For example, some injuries of the region of the orbit, with extensive losses of tissue, and cases of complete loss of the ear; both of which require the restoration of such delicate and intricately formed parts as to be sometimes too involved for plastic repair.

The age or physical condition of the patient may be another reason for choosing prosthetic replacement of lost parts rather than surgery; and for the temporary concealment of defects during periods of waiting between operations the prosthesis is invaluable.

Patients who have suffered facial disfigurements develop mental symptoms which are frequently as serious as the physical condition from the standpoint of treatment. The immediate improvement in the appearance of these patients which is afforded by a prosthesis, which can be constructed in a few days, goes far toward alleviating the mental distress and restoring social equilibrium and poise.

The one who undertakes to construct a facial prosthesis must possess a combination of artistic ability for the carving of the pattern, and mechanical skill for the construction of the appliance. The experienced prosthodontist is certainly possessed of the mechanical ability, is experienced in the use of various necessary materials and in addition often has greater artistic ability than is realized. The training of a dentist in the carving of life-like reproductions of the organs within the oral cavity prepares him for the more extensive carving necessary in extraoral work. Several dentists have recently discovered unsuspected talent in sculpture and are becoming widely known in artistic circles. To the prosthodontist, therefore, most of this type of work will eventually be brought.

The defect to be repaired will usually involve a part of the face, possibly including the eye, ear or nose; more rarely it may be a finger or other part more remote from the usual dental field which requires replacement. Whatever the defect, the first step is to construct a model, duplicating the region of the

*From the Department of Prosthesis, Army Dental School, Washington, D. C.

injury and the adjacent parts, frequently including similar parts on the opposite side of the face with which the prosthesis must harmonize. Taking the impression for a facial model is a comparatively simple operation, much less difficult in fact than a full denture impression, and does not deserve the fear and timidity which it so frequently inspires in many minds. The impression can be taken in any dental office in fifteen to thirty minutes with the materials always at hand. While a table with a pillow is convenient, a dental chair with the patient reclining in a horizontal position is perfectly satisfactory.

IMPRESSIONS

The first step in taking an impression for a facial model is to block off those parts of the head which are not to be included in the area to be duplicated. Several materials have been advocated for this purpose, but one of the most

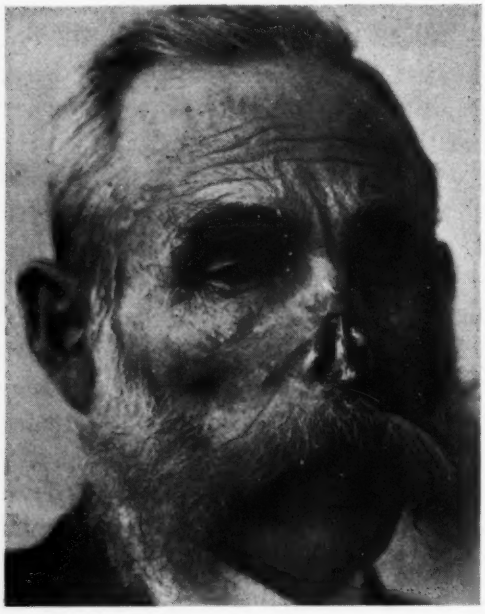

Fig. 111.—Loss of both alae following operation for malignancy.

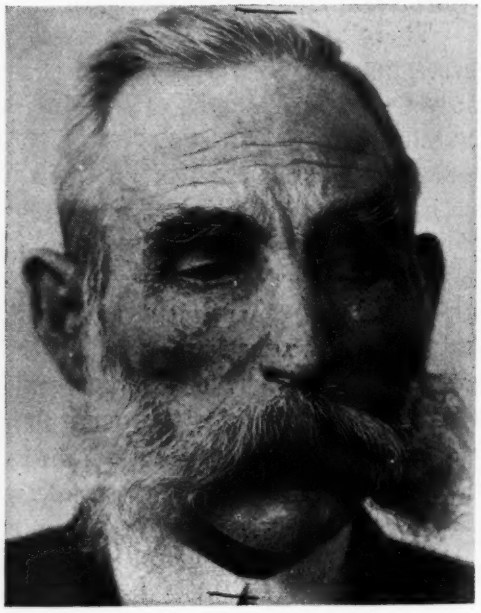

Fig. 112.—Nasal prosthesis constructed of cast aluminum, colored with artists' paints, and retained by adhesives.

convenient methods which has been found is the use of moist hand towels, well wrung out, twisted lengthwise in soft rolls and placed as a wall or dam around the periphery of the area. The towels are plastic and easily molded to shape, and they remain in whatever position they are adjusted.

If a working model only is desired, it should include a slight margin of the hair line, should extend laterally to a vertical line immediately in front of the ears and should cover the chin to the angles of the mandible. In some cases, where most of the carving will be done on the face, a much smaller model including only the defect itself will be sufficient. On the other hand if an exhibit model is desired, the impression should extend at least one inch above the hair line and should include both ears in order to present a lifelike appearance.

After the towels are placed in position, put small rubber tubes, approximately two inches long, in the nostrils to provide breathing space for the patient, packing vaselined cotton around the tubes to prevent ingress of plaster. This cotton must be packed lightly to avoid distortion of the alae. Insert vaselined cotton in the ears and in any other openings which may be present; and if the model is to include both ears, place a roll of vaselined cotton behind the ears to facilitate the removal of the impression. This will, of course, make a defect in the model, which must be corrected by carving. If the details of the eyes are not desired on a working model, place a small piece of moistened tissue paper or cigarette paper over each eye, which will avoid the complications caused by the adherence of eyelashes to the plaster. Cover the exposed area of the skin with a thick coating of cocoa butter using an extra amount in the hair areas such as the eyebrows and eyelashes.

Fig. 113.—Gun-shot wound of the orbit requiring plastic operation.

Fig. 114.—Prosthesis for the temporary concealment of the defect while awaiting complete sterilization of the field. Before painting.

Prepare a water-bath holding a small glass of molten low-heat paraffin maintained at a temperature of 150° F. This outfit must be held close to the field of operation. With a medium-size camel's hair brush, paint the facial surface with the paraffin, applying it freely and rapidly until a coating approximately 2 mm. thick is obtained. This operation will require some practice since the paraffin congeals very quickly, but the necessary skill will be readily acquired. The paraffin, at this temperature, will not be uncomfortable to the patient. Prepare a mix of medium-setting model plaster which is sufficiently stiff that it will not run freely, and cover the surface of the face to a thickness of 2 cm. The writer finds it more convenient to mix this plaster with the hands in a large basin and to apply it and smooth it with the fingers rather than with a spatula. Do not use an accelerator in this plaster mix,

as the resultant heat would soften the paraffin and produce discomfort to the patient. When the plaster is thoroughly set, remove the mask by direct traction without sectioning.

No separating medium is required over the surface of the paraffin but any exposed plaster should be painted with sandarac varnish or some other separating medium. Pour the model of any fine grade of model plaster such as Snow-white. The layer of paraffin facilitates the separation of the model from the impression and usually allows direct separation without any preliminary chiseling.

PATTERN

If the restoration is to be fairly small, the pattern may be built up in plasticine and the carving done directly in this material. Wax spatulas and

Fig. 115.—Gun-shot injury to the orbit with extensive inoperable defect.

Fig. 116.—Prosthesis constructed of cast aluminum, painted, and retained by spectacles. Eyebrows are represented by painting, but the eyelashes are simulated by fine oxidized copper wire.

other dental carving instruments will be all that are needed for the carving. The margins of the pattern must be thin and flush with the surrounding tissue and must be placed in shadow lines or in natural tissue folds in order that they may be as inconspicuous as possible. The practice, which sometimes obtains of taking an impression of a similar portion of the normal face in order to procure a pattern of the desired contour, is entirely unnecessary, since by using the corresponding portions of the face on the opposite side as a guide, it is quite simple to shape the pattern to the desired form.

Lubricate the adjacent surfaces of the plaster model and pour a plaster mold over the pattern, overlapping the margins of the pattern by at least one-half inch. This plaster mold then serves as a master matrix in which any number of wax patterns may be formed. In extensive cases, the original pat-

tern may be made of base plate wax, as most dentists can carve more readily in wax than in plasticene. In addition the wax pattern may be adjusted to the face and the final carving done while it is in that position. A mold of this wax pattern should also be made, however, for the preparation of duplicate patterns both for use in case of an accident during the later mechanical processes and for record purposes.

The final pattern is made by placing sheet wax of the desired thickness into the lubricated plaster mold and while the wax is still soft replacing this mold in position on the facial model, thus giving the proper tissue adaptation.

THE PROSTHESIS

Many materials have been tried for prosthetic apparatus, including rubber (soft and vulcanized), gutta percha, gold, silver, platinum, tin, aluminum, copper, glass, porcelain, celluloid and waxes. The rubber compounds have the advantage of being easily constructed, and since they are not conductors of

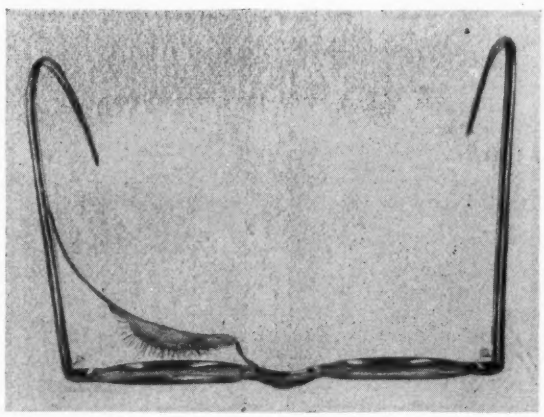

Fig. 117.—Top view of the prosthesis, showing the half-round 14G gold wires which attach the prosthesis to the spectacle frames. These wires lie in contact with the tissue and are cemented into holes drilled in both the prosthesis and the frames.

heat, they are more comfortable for the patient in cold weather. The rubber compounds are, however, difficult to obtain in the proper colors and paint does not adhere to them very tenaciously. The wax compounds present the most lifelike appearance and may either have the coloring material incorporated within them or may be painted to a very exact likeness of natural tissue; but they are very delicate and must be replaced frequently. Sheet metal is the most durable and may be painted to the desired color. The chief objection to metallic appliances is that they are extremely uncomfortable to the patient in cold weather. In spite of this objection, however, the metallic prosthesis seems to be the most generally desirable.

Metallic prostheses may be made by two methods: by casting or electroplating. The technic for the casting method is as follows:

Make the pattern of sheet wax of the desired thickness. The thickness used may vary from one sheet of 28 gauge casting wax to a maximum of one thickness of base-plate wax. Warm the wax slightly and adapt it to the inner surface of the master mold being careful to avoid folds, tears or extremely

thin areas. Trim the pattern to the periphery of the mold and reinforce the margin with a strip of one thickness of base-plate wax. Warm the periphery and then press the mold against the facial mold to secure the proper tissue adaptation. Both of the plaster molds should be lubricated to prevent adherence to the wax, either by the use of cocoa butter or by saturating them in water. When the pattern has been shaped as desired and tried on the patient to test for adaptation and esthetics, attach the sprue according to the type of casting machine to be used, invest and cast, using pure aluminum. Aluminum has the advantages over other metals that it is light, strong, untarnishable and that paint adheres to it tenaciously. After the pattern is cast, cut off the sprues and trim off any irregularities. The pattern should not be finished to a high polish, as this would interefere with the adhesion of the paint. Either the emery

Fig. 118.—Extensive loss of tissue following removal of a carcinoma which originated in the maxillary sinus.

Fig. 119.—Prosthesis for the concealment of the wound during the interval before plastic operations are possible. Shown without the cosmetics which conceal the line of demarcation between the appliance and the face.

arbor or a wire scratch brush will give a desirable surface for the adhesion of the paint. At this time, the retention apparatus should be constructed. If the appliance is to be attached to spectacle rims, drill holes into the margin at the nearest points to the frames, into which half-round 14 gauge gold wires may be fastened with dental cement. The other ends of these wires will later be cemented into similar holes drilled into the frames or temples of the tortoise shell spectacles. Before attaching the appliance to the spectacles, the painting must be done.

The electroplating technic is as follows:

Construct a wax pattern as before with the difference that its thickness is of no importance. The surface of this wax pattern is to be coated with a material which will make it a conductor of electricity, such as flake graphite.

Wires will be inserted into the margin for the electrical connections. While it is possible with considerable practice for the electroplating operation to be done in a dental office, it is much simpler to take the wax pattern to an electrotype foundry where a copper coating of the desired thickness will be given to it for a very moderate charge. Electroplating presents many difficulties to the amateur, and since these appliances will not be made very frequently, it is more practicable to depend upon the professional plater for this kind of work. The copper coating should be 1 mm. in thickness. Eberly recommends a primary coating of copper, an intermediate coating of brass and then a final coating of copper, stating that the layer of brass adds greatly to the strength of the appliance.

The disadvantage of the copper mask is the corrosive action of perspiration upon it. To prevent this, the margin, which will come in contact with the

Fig. 120.—Gun-shot injury resulting in partial loss of the ear.

Fig. 121.—Prosthesis of cast aluminum, retained by adhesives.

tissue should be heavily gold plated. Retention wires for attachment to spectacles may be imbedded in the wax pattern before the plating process and will become attached to the copper coating during the process of deposition of the metal.

PAINTING

The coloring of a prosthesis is one part of the operation which will probably be beyond the skill of most dentists. An artist should be called upon for this coloring using regular artists' paints. McKenzie recommends the use of oil colors with a wax medium, while Axt recommends celluloid Zapon paints. Securing lifelike coloring requires the greatest care and skill, but even under the most favorable circumstances a perfect likeness of living tissue is rarely obtained. For the concealment of the appliance, recourse must be had to cosmetics.

Nasal appliances, frequently quite small, may be retained by the use of spirit gum, a medium commonly used for the retention of false mustaches and may be obtained at any pharmacy. Axt recommends the following adhesive solution:

Para rubber	1 gr.
Gum mastic	15 gr.
Chloroform sufficient to make	100 gr.

The adhesives will retain the appliance for a considerable length of time but must be renewed daily.

Nasal restorations may also be retained by spectacles, attaching the appliance directly to the bridge of the spectacles by riveting. Eye prostheses are usually retained by spectacles although very small ones might be retained by the adhesives given above. The eyebrows may be reproduced by painting

Fig. 122.—Complete loss of the ear resulting from severe burn.

Fig. 123.—Cast aluminum prosthesis, retained by adhesives.

or by the use of real hair which may be obtained in most large cities at a doll shop. The lashes may be reproduced in several ways. Thin, oxidized, copper wires may be imbedded in cement placed in grooves cut along the margins of the lids, or Nesta theatrical eyelashes may be procured and attached in a similar groove.

Eye prostheses are the most difficult type encountered since they involve that elusive quality called "expression." The slightest variation in the shape of the eye will make a considerable difference in the expression of the face. In addition, the natural eye, which we are trying to imitate, is constantly changing shape and position, and it is necessary to decide on the exact position which is to be reproduced. A slight closure or drooping of the lids will be less conspicuous than the staring appearance presented by lids which are open too widely. The artificial eye is retained in the prosthesis by means of small pro-

jections similar to the prongs used in mounting jewels. Since the artificial eye is stationary, the patient must be trained to keep the normal eye focused in the same direction by movements of the head. The difficulty of keeping the two eyes parallel by this method makes it questionable as to which is the more desirable; constructing the prosthesis with an open eye or with a closed eye. Neither is entirely satisfactory.

Artificial ears may be made of flexible rubber or plastic waxes with better success than any other restorations. They are retained entirely by adhesives, since mechanical retention is quite difficult in this region. In case plastic waxes are used, the patient should be given a two-part mold in which he may prepare duplicates as often as may be necessary. The cast aluminum ear is more serviceable than either of the other materials named, but its weight makes retention more difficult. Axt illustrated a wax ear covered with copper by the electroplating process and provided with a layer of gold over the surface which was in contact with the tissue.

COSMETICS

The line of demarcation between the margin of the appliance and the natural tissue may be concealed by the application of nose putty of the proper color, diluted to a soft, sticky consistency with liquid petrolatum. This material must be sufficiently plastic and adhesive to follow any movements of the tissue due to muscle action.

Complete concealment of the prosthesis is best obtained by the liberal use of liquid face powders of the proper shade, applied freely over both artificial and natural surfaces. The patient will become very expert in this operation, as the incentive is sufficiently impelling, and the final result, the art which conceals art, depends in the last analysis upon his skill.

Even though the results are not perfect, they are usually sufficiently satisfactory to remove the feeling of aversion which these unfortunates frequently arouse among their fellows and to permit them to regain their place in social and industrial circles.

In making life bearable for one who has found only misery, the prosthodontist finds his reward.

NOTE.—This is the sixth and last of a series of articles by Captain Bodine.

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FRACTURE OF JAW OF EPILEPTIC PATIENT

Report of Case

By M. Hillel Feldman, D.D.S., New York, N. Y.

THE radiograph (Fig. 1) shows a case which occurs rather infrequently and therefore would be of some interest.

Patient gave the history of having fractured his jaw during an epileptic seizure which threw him violently to the floor.

The problem for reduction of fracture in this case was how to give the injured mandible physiologic rest, having in mind the possibility of a subsequent epileptic spell during the course of treatment. It would be manifestly inadvisable to close the maxilla with wiring or any other means to this end,

Fig. 1.

because when the epileptic is seized with his convulsion there is a danger of strangulation, as in many cases there is an accompaniment of nausea.

To overcome this danger I constructed an aluminum splint which I cemented to the young man's teeth. It is only necessary to add that all pain in the region of the fracture ceased from the moment of the introduction of this appliance. I believe that a good many fractures of the mandible might be handled with some modification of this technic without actually closing or fixating the mandible to the maxilla.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

AN INTRAORAL HOLDER FOR INTENSIFYING SCREENS

By Dr. Clarence O. Simpson, St. Louis

IN REPLY to questions regarding the possibility of making occlusal view radiographic examinations of the maxillary regions with the small dental units, for years I have stated that it was not feasible without improvising a holder with intensifying screens for the purpose. The 45 kilovolt capacity of these machines gives insufficient penetration to register clear images of the teeth through the cranium, brain, and maxillae, without intensification of the actinic effect of the rays. The need for a method of using screens in the mouth led to the experiments which produced this satisfactory holder. Before practical tests were made, there was some doubt of the teeth being sharply defined because of the low penetration and the screen grain, but the results were agreeably surprising.

The principal difficulties in constructing the holder were to provide even pressure for screen contact and to limit the bulk of material for insertion in the mouth. If the screens are not maintained in contact with the film during the exposure, the images will be blurred and fogged. Even pressure of the teeth cannot be secured over a large area, excepting upon a thin or flexible object. A holder of suitable thickness placed between the molars prevents contact of the incisors with it, and a flexibility which is adaptable to the occlusion would damage the screens. Aluminum could be used for the upper section of the holder and lead for the lower, but unless the aluminum were about one millimeter and the lead two millimeters in thickness, they would bend under the pressure of the teeth. Also, it is difficult to attach the screens to the metals. For these reasons cardboard was found to be more satisfactory.

To construct an intraoral holder for the use of intensifying screens, you should obtain a 5×7 screen and an Eastman lead-backed film holder. From the screen cut two sections $2\frac{1}{2}$ inches wide and 3 inches long and trim the corners with curved scissors. From the front of the film holder cut a section to fit the screens, to serve as the top of the intraoral holder. From the back of the film holder, which is lead lined, cut a section the same form and dimen-

sions as the screens and bind the cut edges with a passepartout or lantern slide, binding strip to hold the cardboard, lead foil, and paper covering together. Then place the two pieces of cardboard together with the lead lining inside and attach them along one side with a strip of one-inch adhesive tape. This forms a hinged cardboard holder, with lead foil inside the lower section

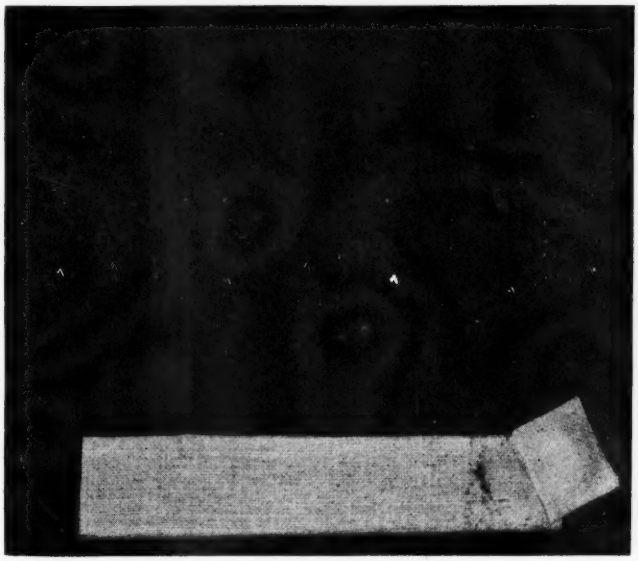

Fig. 1.—The top of the intraoral film holder, showing the exact size.

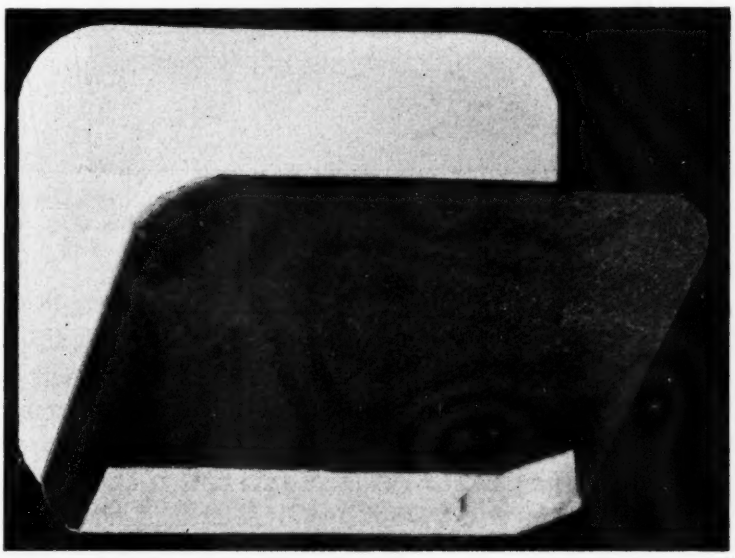

Fig. 2.—Illustration of the intraoral film holder partly opened, showing one of the intensifying screens.

to absorb the secondary radiation. Next, attach one of the screens with double coated adhesive tape to the inside of each section of the cardboard holder, so when the holder is closed the screens will be in contact with each other. After the screens are attached, place the holder under a weight for several hours to increase the adhesion of the tape.

The screens are attached after the cardboard covers are connected, to improve the contact of the screens in the completed holder. The hinged side of the holder should be used as the anterior between the incisors, because the occlusion of the molars produces ample pressure on the posterior. A lead letter or marker should be placed on one of the anterior corners to identify the right and left regions.

To use the intraoral holder for occlusal views of the maxillary regions, double-coated films will have to be cut from 5 × 7 or larger sheets to fit the holder. The cutting of the film to size is facilitated by using scissors and a cardboard or metal pattern slightly smaller than the desired size of film. By holding the film covered by paper in which it is packed against the pattern, the film may be cut accurately with the least manipulation. It is convenient to cut several films at one time, so a supply will be available when needed. After removing the film from the paper and inserting it between the screens,

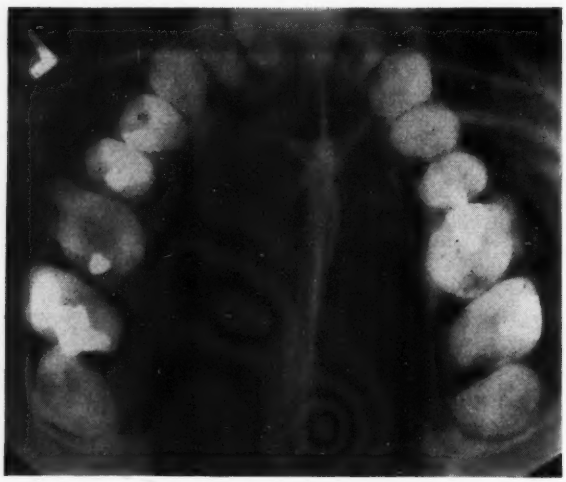

Fig. 3.—An occlusal view of a maxillary arch made with the intraoral film holder and intensifying screens. Forty-five kilovolts and ten milliamperes were used at a target-film distance of 18 inches with an exposure of four seconds.

the holder should be tightly wrapped in black paper to exclude the light and then in clean white paper to exclude moisture. The glazed, thin, typewriter paper used for carbon copies makes an excellent covering for the packet. The wrapping should be done systematically, so a mistake will not be made in placing the holder in the mouth. If the lead lined surface of the holder is toward the tube, the rays will not penetrate it; and if the marked corner is not on the anterior side, it will be confusing. The lead marker will identify the upper front side but may not be felt distinctly through the paper covering. To avoid a mistake in placement the position of the holder should be kept in mind while wrapping, the outer cover folded on the top of the packet to present the smooth surface to the tongue, and the posterior corners bent upward and inward to prevent irritation of the buccal mucosa.

The packet may be inserted gently into the mouth by placing one end of the packet against the corner of the mouth and stretching the opposite corner of the mouth with the finger while the packet is carried to place. In the final

placement of the packet the corners of the mouth should be drawn out to a comfortable position rather than stretched backward, and care must be used in centering the dental arch on the holder. For young children the holder may be inserted endwise, or with the shorter dimension laterally. After the placement of the packet, the patient should be instructed to hold it tightly with the teeth and in contact with the maxillary incisors by pressing upward with the thumbs under the anterior corners. The target-film distance should be about 18 inches, which with most of the small dental units places the end of the cone about 4 inches from the top of the head. With 45 kilovolts and 10 milliamperes the correct exposure will be about four seconds.

ABSTRACT OF CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery, Surgical Orthodontia, Dental Radiography

Bacterial Destruction of the Enamel. C. F. Bödecker (New York) and H. W. C. Bödecker (Berlin), Dent. Research, February, 1929, ix, 1.

The authors conclude that the enamel is destroyed during dental caries by two agencies: first by acid, probably lactic acid formed by the Bacillus acidophilus; and second by the action of bacteria on the protein of the enamel. The bacteria involved are not exactly known but are presumably forms of streptococci or diplococci. The proteolytic bacteria thus exert a selective action on certain portions of the enamel, on the enamel rods in which the protein has been calcified, and not on the enamel sheath which is believed to be composed of keratin. The course of the experiment was in part to decalcify the carious enamel with the aid of acid celloidin. The thus decalcified enamel was then embedded, and the finest possible sections were made—as thin as 3 microns. The sections were then stained with a special stain which makes possible recognition of the bacteria. Great differences obtain between normal and carious enamel, and a sort of No Man's Land is seen between the two zones which takes the stain more intensely than either of the latter. It appears that a degenerative process must precede the attack of the bacteria, and its existence has never before been recognized or even suspected. The authors term it provisionally the ZCD (zone of carious degeneration). We now have to bear in mind the other factor in caries, the acid element, which it appears is the original factor which paves the way for the attack of the bacilli, although the authors do not seem to commit themselves outright to teaching that the acidity is responsible for the zone of carious degeneration. But this is the necessary inference.

Some New Fundamentals for the Prevention of Dental Disease. W. A. Price (Cleveland), Dental Cosmos, February, 1929, lxxi, 2.

Dr. Price refers principally to the processes of calcification and decalcification. The author's elaborate experiments have to do largely with the experi-

mental use of ergosterol, cod liver oil and other antirachitic substances in the lower animals and man, and he is encouraged to believe that raw and activated cod liver oil may be made to prevent caries just as they are already able to prevent rickets. It may also be required when there is calcium waste or extra utilization as in pregnancy, to give lactate of calcium. In other words caries may be due to the lack of activation of the food substances by ultraviolet light. His experiments have not shown that ergosterol has any marked value as a preventive of caries, but it will be well to await the result of further research. This apparently contradictory reasoning may be due to the fact that over-treatment is injurious and defeats the aim of the dentist, for even with very minute doses of ergosterol the results obtained were discordant, not what in theory we should anticipate. As in all feeding of this kind everything may depend on the choice of the samples used, for different makes of cod liver oil give uneven results, and again food substances which have been irradiated must be given at once lest they lose the results of irradiation and become quite inert. The author believes that the raw oil has antirachitic properties and would mix raw with irradiated oil in his efforts to prevent caries. The experiments recorded in mankind were in no sense therapeutic in their aims but restricted to the study of fluctuations of serum calcium and serum phosphorus under the various plans of giving antirachitic food substances.

Dental Infection as Cause of Thrombosis of the Cavernous Sinus. O. J. Dixon (Kansas City, Mo.), Dental Cosmos, February, 1929, lxxi, 2.

About 300 cases of the fatal condition known as thrombosis of the cavernous sinus are now on record, and the source is most frequently an infection of the skin of the face. Thus far there has been a very slight reference to dental infection in this connection in dental literature. The author, who is a surgeon, has now seen eight cases of this thrombosis in his practice, and three of these were the result of dental infection. No one knows why a small percentage of simple traumatisms or infections are complicated by extension to a vein with thrombophlebitis and extension along the venous system to the cranial sinuses. In all three of the author's dental cases there had been traumatization, although in the ordinary external case trauma is either absent or is limited to picking a pimple with a septic finger nail. In the first of his cases which was in a man forty years old, tooth sockets had been curetted; the source of the sepsis was probably an acute nasal infection. The patient died with septicopyemia and meningitis. The second patient was a boy five years old. Infection of a deciduous molar followed an attempt to treat a cavity and a subsequent attempt to drain an abscess, but from the history of the case the patient may have been doomed even in the absence of any treatment. The third case was in a girl sixteen years old who had been submitted to an extraction without curettage of the socket. Both these patients died of septicopyemia complicated with meningitis, and in this third patient, too, it is possible that the case was not dependent on the traumatism inflicted. This appears to be the opinion of the author, with which the reviewer concurs.

Influence of Parenteral Injection of Tooth Cell Substance on Growth and Structure of the Teeth. M. Shibata (Tokio), Jap. J. Exper. Med., November 10, 1928, vii, 1.

This is the author's second report on this subject. Tooth substances which were taken from the pig and comprised enamel organ, dental papilla, dental pulp, etc., were injected into other animals in the abdominal cavity evidently before dentition, and the latter process was then studied. White rats are the animals mentioned especially and also cats. The results do not show constancy and differ somewhat with the tissue injected. Much also depends upon the amounts injected, for it is possible by overdosage to retard the growth of the teeth. Large amounts seem to behave as antigens and to give rise to the formation of antisubstances, and in this way the animal becomes immune to the injections, which fact probably explains why reckless injections may have opposite effects as compared with small ones. Generally speaking the results are those which in theory should be anticipated. A mixture of the two odontomers, enamel organ and dental papilla, gives a better result than either alone, provided the amounts injected are small. In the most successful injections the activity of dentition and the formation of tooth substances are promoted; calcification is dense and dentition is regular both as to deciduous and permanent teeth. The author appears to believe that there is an automatic hormonic regulating agency in the body and that these injections have a stimulating effect upon it. As yet no practical deductions in the direction of prevention and arrest of caries are suggested.

Nutrition and Pediatrics

Experiments of the Nutritive Properties of Gelatin. Richard W. Jackson, Beatrice E. Sommer and William C. Rose. J. of Biol. Chem., November, 1928, lxxx, 1.

A study of the literature would seem to indicate that whatever may be the nutritive deficiencies of gelatin, they are not associated with an incapacity of the alimentary enzymes to accomplish its digestion. The authors have undertaken a further study of the inadequacies of gelatin as a source of nitrogen for maintenance and growth. White rats were used as the experimental animals. The experiments indicated that diets containing gelatin as the sole protein at levels of 15 to 55 per cent are not suitable sources of nitrogen, even when supplemented with amino acids known to be missing or present in relatively small amounts.

The Influence of Diet on the Structure of Teeth. May Mellanby. Physiol. Rev., October, 1928, viii, 4.

In an excellent contribution and a review of the literature, May Mellanby states that there is a definite relation between defective dental structure and caries, and that the structure of the teeth can be controlled by diet. Most of the experimental work has centered around diet and the production of caries in teeth and also vitamine C in relation to tooth formation. The

writer further states that these defects produced by a deficiency in this vitamine C are not commonly found in man. On the other hand the experiments of both E. Mellanby and M. Mellanby are concerned with defects of structure, and the term "defect" or hypoplasia is used by them to indicate any departure from the ideal structure, both from the macroscopic appearance and the microscopic appearance.

The author reviews some of her experiments with E. Mellanby in 1918 in which they indicated that the structure of the developing teeth and the calcification of the bones of puppies were dependent for their normal development on the presence in the circulation of an antirachitic vitamine (now universally accepted as vitamine D), the existence of which was denied by many investigators until two or three years later.

In 1922 E. Mellanby first introduced his experiment which indicated that certain foods, such as cereals, tended to prevent calcification. Of the cereals oatmeal was the worst offender.

Besides hundreds of experiments on rabbits and rats, observations were made on 1400 domestic dogs and over two thousand ground sections of their teeth and jaws.

In reviewing the work of M. Mellanby, the author states that the diet is seen to influence the formation of teeth in three ways:

(a) The calcifying vitamine (vitamine D) increases and indeed seems to control the actual calcifying process.
(b) Cereals act in the opposite way and specifically interfere with tooth calcification.
(c) Since teeth are made up so largely of calcium and phosphorus, the diet must contain sufficient of these elements, though the minimum requirements depend largely on (a) and (b).

In regard to the calcifying or antirachitic vitamine D, it is known that cod-liver oil, butter and suet improve calcification. Where the fat of the diet consisted of vegetable oil defective structure resulted. Heating of fats to 120° for varying periods destroyed their power of calcification.

In regard to food, egg yolk rich in vitamine D greatly stimulated tooth calcification. Lean meat and whole milk, the vitamine D content of which varies with the food and the environment providing the milk, also stimulate calcification. Green vegetables slightly improve calcification since they are poor in vitamine D, particularly in the winter months.

The evidence available in the case of the development of children's teeth show the effect of a fat soluble vitamine in the diet is to produce perfect, or nearly perfect, calcification just as in the puppy experiments.

In regard to the interfering effect of cereal and cereal products it was found the greater the amount of cereal the greater was the tendency to the production of badly calcified teeth.

All attempts made to isolate, or even to gain some insight to the composition of the interfering substance contained in cereals have failed, but the anticalcifying effect of any of the cereals can always be prevented or an-

tagonized by the addition to the diet of sufficient vitamine D. Moreover the addition of calcium carbonate or calcium acid phosphate to a diet containing oatmeal brings about improvement in the calcification of teeth. Fortunately, most natural food mixtures appear to contain enough calcium for the production of perfect teeth, provided that sufficient vitamine D is present, since the disposition of calcium and phosphorus depends largely on the available vitamine D contents.

Valuable and startling results were obtained by a host of investigators which demonstrated excellent results on calcification by ultra-violet radiation, and also by sunlight.

Finally in 1927 Rosenhein, Webster, Hess and Windaus, proved that one of the products of ergosterol from ultra-violet radiation was vitamine D. It is also interesting to note that foods, for example olive oil, devoid of vitamine D, acquired this after radiation and naturally had the power of improving the structure of developing teeth. M. Mellanby also showed that oatmeal when exposed to ultra-violet radiation brings about the development of sufficient vitamines from the inactive ergosterol to antagonize completely the anticalcifying influence of the original oatmeal. In other words, oatmeal after being exposed to ultra-violet radiation now becomes a potent factor in the formation of teeth.

The writer also feels that in human teeth secondary denture is often found, sometimes resulting from attrition, and sometimes in response to caries. Moreover, the quality of the secondary denture is influenced by diet, particularly vitamine D.

E. Mellanby states that some of the results of the experiments in puppies have been extended to children and have been found to hold good. She also feels that the people in England have poor teeth structure because the climate is sunless and they consume a lower consumption of milk, butter, whole milk, cheese and eggs, all of which are plentifully supplied with vitamine D.

The Effect of Inadequate Vitamine B upon Sexual Physiology in the Male. Herbery M. Evans. J. of Nutrition, September, 1928, i, 1.

From a series of interesting experiments on rats, this authority concludes that in both acute and chronic deficiency in the antineuritic vitamine (vitamine B) both the anatomic and functional integrity of the male germ interest destroyed, although in autopsy these glands were found to be normal, and the examination of fluid from the epididymis demonstrated motile cell remain unaffected. Only during the few days preceding death was sex sperm.

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EDITORIALS

Why Not an American Board of Orthodontia?

IN THE December issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY appeared an editorial "Licensing Specialists." We called attention to the proposed law in the state of California regarding the licensing of orthodontists. The February issue of the *Dental Items of Interest* contains an editorial regarding the proposed California law and also a letter from Dr. Guy S. Milberry, dean of the University of California, College of Dentistry.

We would advise our readers to study the editorial in the February number of the *Dental Items of Interest*. We agree with the arguments presented by the editor of that journal. Dr. Milberry states in his letter "the bill will not be introduced in the legislature of California at its next session, January, 1929, because the joint legislative committee of the two dental societies of California recommended, after hearing the question debated fully on both

sides, that it be referred for further study to a committee of eleven, including the presidents of the two dental societies, two members of the Board of Dental Examiners, two members of the Pacific Coast Society of Orthodontists, two graduates of the Angle School of Orthodontists and the deans of the three dental schools."

It seems as though everyone has been represented except those particularly interested in the action of this law. We refer to the general public and the patients. Strange as it may seem, all legislation relative to medicine, dentistry and law has been advanced by these professions supposedly for the benefit of the public, yet the public has not been considered in any of these legislative acts. For a number of years we have been interested in medical, dental and legal legislation, and all of the laws regarding these professions which have come under our observance have been written for the benefit of some particular group of individuals within the profession.

The Board of Regents in the state of New York claims that the medical, dental and legal legislation in New York can be taken as a model for other states. But even in New York State the laws have not been made for the benefit of the public. At the present time there is a bill in the New York legislature introduced by the Board of Regents which gives the Commissioner of Education more autocratic power, and which power in no way benefits the public and the patients or offers any advantages to the dental profession. We mention this because the proposed California law regarding orthodontia would not in any way benefit the public and the patients, nor do we think it would help the profession.

We note with surprise that the committee of eleven that is to study the proposed bill is composed of two members of the Board of Dental Examiners, two members of the Pacific Coast Society of Orthodontists, two graduates of the Angle School of Orthodontists. We ask, why two graduates of the Angle School of Orthodontists? Are there no other schools of orthodontia that are recognized by the orthodontic and dental profession? Also, why two members of the Pacific Coast Society of Orthodontists and no representative from the American Society of Orthodontists when the American Society is the oldest and largest society in this field? The very composition of this joint legislative committee would lead Hamlet to remark, "There is something rotten in Denmark."

To our mind the proposed California law is the most objectionable piece of legislation that has ever been suggested for the dental profession and the orthodontic specialists. We admit that some effort should be made to standardize specialists in orthodontia. The public should have some means of knowing what men have a high degree of efficiency and training in this practice, and in our January, 1929, editorial we called attention to the movement to create a board of obstetrics and gynecology and published the outline and plans, which with a little modification could be utilized in granting a certificate of proficiency to men who are engaged in the practice of orthodontia.

At the business meeting of the American Society of Orthodontists in 1926, Dr. W. C. Fisher, then president of the American Society of Ortho-

dontists proposed that a fellowship be granted by the Society. Dr. Fisher consulted with a number of men in the orthodontic field regarding this project, and many of them were in favor of the fellowship. Dr. Fisher's plan was an amendment to the constitution of the American Society of Orthodontists, which would create a fellowship committee. The writer of this editorial objected, because the members of the first board who were to choose candidates for the fellowship were named in the proposed amendment, which virtually meant they were appointed by the president of the Society without any vote of the Society. Other objections developed to Dr. Fisher's fellowship plan during the ensuing year, with the result that he (Dr. Fisher) withdrew his plan. It is our belief, however, that Dr. Fisher's plan had considerable virtue and that some similar arrangement making for efficiency in the practice of orthodontia should be adopted by the American Society of Orthodontists.

We are presenting some of the facts regarding the American Board of Otolaryngology—its origin, aims and methods, which we hope will be studied by the members of the American Society of Orthodontists in order that an American Board of Orthodontists may be created at the meeting of the Society at Estes Park. This board can be created by the adoption of a standing resolution, without the necessity of making a change in the constitution or administrative by-laws. The constitution can be changed if after a trial it is found desirable, or the board can be created by a constitutional amendment at Estes Park if unanimous consent is given.

We have given considerable study to the origin of the American Board of Otolaryngology, and we find that in 1924 the American Otological Society, the American Laryngological Association, the American Laryngological, Rhinological and Otological Society, the American Academy of Ophthalmology and Otolaryngology, and the Section on Laryngology, Otology and Rhinology of the American Medical Association, each appointed two members, making a total of ten members, to constitute the first American Board of Otolaryngology. These appointments were made at the request of Dr. George E. Shambaugh of Chicago, whose persistent efforts resulted in the establishment of the board.

As the local and national orthodontic societies are represented in the American Society of Orthodontists, it is our belief that the first Board of American Orthodontists should be created at Estes Park at which meeting members representing the various sections of the country will be present.

At the first meeting of the American Board of Otolaryngology which was held at the University Club in Chicago in November, 1924, the board decided to issue a pamphlet outlining its provisions. The chief activities of the board are as follows:

First: To establish standards of fitness to practice otolaryngology.

Second: To investigate and prepare lists of medical schools, hospitals and private instructors recognized as competent to give the required training in otolaryngology.

Third: To arrange, control and conduct examinations to test the qualifications of those who desire to practice otolaryngology and to confer a certificate upon those who meet the established standards.

This board does not grant a degree nor does it make any attempt to control the practice of otolaryngology. It simply aims to arrange a standard of fitness for the practice of otolaryngology and to certify those who voluntarily apply and who satisfy the board's requirements. The work of the board is satisfactory as is proved by the following resolution adopted by the Board of Regents of the American College of Surgeons at Philadelphia in October, 1925:

Be It Resolved: That the College will recognize the certificate of the American Board of Otolaryngology as evidence of the professional fitness in otolaryngology of candidates for its fellowship who hold such certificate, but will demand in addition that such candidate comply with all other requirements of the College as to character and ethical qualifications. This does not imply that the College is to decline to admit to fellowship, otolaryngologists who comply with their requirements, even if they have not been certified by the board.

Other important societies and organizations are following the example of the American College of Surgeons. Moreover, the certificate of the Board of Otolaryngology is required of candidates for appointments in many and various important positions in hospitals, colleges, etc.

It is our belief that if the American Society of Orthodontists created an American Board of Orthodontists which would issue a certificate of fitness and keep a record of those who qualify, societies, hospitals and other organizations who are interested in the work of orthodontia would in a short time prefer those who have the certificate.

The American Board of Otolaryngology divides the applicants for examination into three classes. The following is their plan of examination:

Class 1.—Those who have practiced otolaryngology fifteen years or more.

Class 2.—Those who have practiced otolaryngology seven years and less than fifteen years.

Class 3.—Those who have practiced otolaryngology less than seven years.

The following general requirements are demanded by the board:

1. For all classes: High, ethical and medical standing in their communities and also a medical degree satisfactory to the board.

2. Formal application on an official blank with two letters of endorsement by well-known otolaryngologists.

3. Case histories may also be requested; this requirement is left to the judgment of the board.

The additional requirements for the three classes are as follows:

Class 1.—The board will determine from the applicant's training, published records, and professional work in his community, whether further examination will be necessary before conferring its certificate. Case histories may also be required if in the judgment of the board they be desirable.

Class 2.—Report of twenty-five cases that have been observed and treated by the applicant.

Class 3.—A degree from a medical school of high standing, satisfactory to the board of examiners.

"It is preferable that applicants in Class 3 show they have had a year of clinical experience in a general hospital following four years in a medical school preliminary to special study of otolaryngology and service as an ear, nose and throat interne.

"No examination will be given to applicants who have been in actual practice of otolaryngology for less than one year."

Form of Examination.—In determining the question of certification, the examiners rely on the following criteria:

First: The applicant's professional record.

Second: Written reports of the prescribed number of cases that he has observed and treated.

Third: A practical, clinical, and laboratory examination when required.

Fourth: A written examination when required.

By unanimous approval the board had decided to certify those applicants, whose professional records are such as to give them a national reputation, or preeminence in their communities, without a specific examination. The American Society of Orthodontists could also agree to such provision, as there are a number of men in the Society who because of work done in orthodontia in years of practice and clinical skill would be entitled to such certificate of proficiency. The American Board of Otolaryngology selects those men from a group who have practiced fifteen years or more.

The American Board of Orthodontists would render a valuable service to the public by examining and granting certificates to successful candidates. We believe that such a board would have a much better influence upon improvement of orthodontia as a special branch of dentistry than any legislation that could be passed by a state or any pet plan of education that is advocated by certain schools, universities, deans and professors.

The Meeting of the Southern Society of Orthodontia

THE regular annual meeting of the Southern Society of Orthodontia was held at the Dempsey Hotel, Macon, Ga., January 30 and February 1 and 2.

The meeting was presided over by the President, Dr. W. B. Childs. The program as provided by the Executive Committee was very interesting.

Dr. Oren A. Oliver presented a paper on "Lingual Arch Technic." Discussion was opened by Dr. Harry Kelsey of Baltimore. Other members took part in the discussion.

One of the most outstanding papers was presented by Doctor Milo Hellman of New York. The paper was the result of a large amount of research work that has been done by Dr. Hellman to establish the position of the Orbital Plane in the development and growth of the face, and as related to certain types of malocclusions.

The essayist refuted the theories of Dr. Simon in reference to the Orbital Canine Law. He quoted from Dr. Simon's works to show that Dr. Simon states that the position of the canine to the orbit was constant at all ages. Dr. Hell-

man showed that there was a difference in the rapidity of growth in the region of the canine and orbit which produced a variation at different ages.

Dr. Hellman stated that in young patients the denture occupies a more posterior position to the orbit than it does in older patients. During the process of growth the denture travels downward and forward much more rapidly and the orbit changes position.

Dr. Hellman also showed that the position of the canine as related to the orbital point, as mentioned by Dr. Simon in his Orbital Canine Law, varies with different races. This being the case, we would also expect the canine to vary with different types of faces.

Dr. Hellman measured a number of skulls of different races in which the canine showed a range of variability as related to the orbital point in all of the skulls. In certain cases the canine and the entire denture occupies a more anterior position to the orbital point than it does in others. He measured a number of normal skulls and skulls of posterior occlusion (Class II) of the same race, and it was found that skulls of posterior occlusion show that the maxillary denture occupies a position more posterior to the orbital plane, than the position of the denture in skulls of normal occlusion. In fact, the posterior occlusion cases showed that the canine were as far posterior as the most extreme posterior position in normal occlusion. In other words, Dr. Hellman's investigations failed to substantiate the opinion that in posterior occlusion conditions or Class II cases, the maxilla is further forward than it is in normal conditions. In fact, he stated that skulls showing posterior or Class II conditions indicate that the entire denture occupies a position further behind the orbital point than that position found in normal occlusion. Not only is the mandibular arch posterior as related to the face and cranium, but the maxillary arch is posterior in many of the cases.

During the process of dentition both the mandibular and maxillary arch travel downward and forward as related to the face and cranium. Dr. Hellman presented measurements made on his patients, extending over a period of years during treatment and retention, which proved that the dentures were continually growing forward more rapidly than the orbital point moved forward. He showed that the maxillary arch developed forward in posterior occlusion even when intermaxillary rubbers were used to stimulate forward growth in the mandibular arch.

Dr. W. F. Quillian, President of the Wesleyan Female College, Macon, Ga., delivered an interesting address on the "History of Education."

"The Evolution and Anatomy of the Temporo-Mandibular Articulation as Related to the Different Types of Malocclusion" was the subject of an illustrated lantern talk by Dr. Martin Dewey. The discussion of the paper was opened by Dr. C. C. Howard who showed a number of slides and discussed the work done by Dr. A. LeRoy Johnson several years ago in the study of the Temporo-Mandibular Articulation. Dr. Dewey called attention to the fact that the Temporo-Mandibular Articulation and the parts associated therewith made it extremely improbable that the condyle was in an anterior or posterior position in either anterior or posterior occlusion. The misapprehension in relation to this fact arises from the lack of recognition of anatomic conditions.

The greater part of the deformity is located in the body of the mandible, anterior to the attachments of the muscles of mastication.

On Thursday evening a dinner was held at the Hotel Dempsey. Dr. H. H. Johnson gave a talk on "The Influence of Specialization in Dentistry."

Dr. A. H. Ketcham spoke of the accomplishments of the Committee on Arrangements regarding the meeting of the American Society of Orthodontists to be held at Estes Park in July.

On Friday Dr. Lloyd S. Lourie of Chicago gave a paper entitled "Trimming Deciduous Teeth to Favor Normal Eruption of Permanent Teeth or Assist in Correcting Malocclusion." As is usual, Dr. Lourie's paper was extremely practical, valuable and well proved by clinical facts. This paper was well received. Dr. A. H. Ketcham of Denver opened the discussion.

Dr. Benjamin Bashinski, M.D., of Macon, gave a paper on "Some Factors which Accelerate and Inhibit Growth in Children." This paper was discussed by Dr. C. C. Harrold, also of Macon.

A paper by Dr. T. Wingate Todd, Director of the Anatomical Department of the Western Reserve University, showed that the face and cranium of lower animals developed along the same lines as was shown by Dr. Hellman. It is a remarkable fact that two men working on different material regarding the growth and development of the face should arrive at identical conclusions. Dr. Todd made measurements of different parts of human skulls of different races to show the rapidity of development in certain localities. He found that the maxillary arch swung downward and forward, which allowed for the increase in size of the nasal pharynx.

On Friday evening a dinner was given in honor of Dr. Hellman and Dr. Todd. Dr. R. Holmes Mason, of Macon, acted as toastmaster.

Saturday morning was devoted to a business session and to case reports.

Clinics were given by Dr. Lloyd S. Lourie, Chicago, Dr. Oren A. Oliver, Nashville, and Dr. Lowrie J. Porter, New York City.

The next meeting will be held at Washington in 1930.

ORTHODONTIC NEWS AND NOTES

American Society of Orthodontists

Estes Park Meeting

By Albert H. Ketcham

The twenty-eighth annual meeting of the American Society of Orthodontists will be held in Estes Park, Colorado, the third week in July, 1929. Monday evening, July 15, there will be an interesting lecture on the Rocky Mountain National Park by Joe Mills, nationally known as a lecturer, author, and proprietor of the Crags Hotel. The meeting will close Saturday noon, July 20, after a trip through magnificent mountain scenery over the Fall River Road.

A program of outstanding merit has been arranged by our Board of Censors. Papers on growth and nutrition, on skeletal growth, on deficiencies of the essential bone-building salts in the soils of certain agricultural regions, on development of the sinuses from birth as shown by the roentgenogram, will be given by men of international prominence. Differential diagnosis and prognosis of apparent distoclusion and treatment will be given by men of equal prominence. Evolution of the efficient dental apparatus of man, growth of the skull in relation to development of the denture, will be treated by men whose scientific work commands the respect of all orthodontists. Organizing an office for efficient and pleasant orthodontic practice will be given by one who knows, for he has done it. The training of abnormally functioning muscles so that instead of working against successful treatment they may assist, will be described by lecture and movie.

Orthodontic education is a problem receiving most careful consideration from our leading educators. Legislation designed to control the practice of orthodontia and stipulating the minimum educational requirements has become a law in one state, Arizona, and is being seriously considered in another. This subject will be treated by a dental educator of wide experience and broad vision.

A report will be presented on the progess of the experiment in biophysics being conducted by John A. Marshall, under the Orthodontic Grant at the University of California. In this experiment ten monkeys are divided into two groups; one group having a normal diet, and the other a deficient diet. Orthodontic appliances have been placed upon the teeth of monkeys in each group, and tooth movement has now been carried on for several months.

Case reports with time reserved for discussion will be given between papers.

The Round Table Discussions which have proved so popular will be maintained.

Many splendid clinics are promised for Thursday afternoon. An efficient arrangement is planned so that every one may see the clinics of his choice and so that the clinicians may not be interrupted while describing their clinics.

It is planned to start the sessions each morning at 9 o'clock, to adjourn at 12:15 o'clock to the Stanley Manor dining room where luncheon will be served, buffet style, to all in attendance. Afternoon sessions will start at 1:30 o'clock, adjourn by 4 o'clock, thus leaving three hours for recreation before dinner. The only evening session planned is for Monday.

Our program is very full. It is the earnest desire of your Executive Committee that papers, case reports and discussions, all be presented in a clear, concise manner, so that the utmost use may be made of the very valuable time devoted to sessions.

The Local Arrangements Committee is working efficiently in managing the problem presented through holding our meeting in vacation time and at a summer resort.

The fact that we are using four or five hotels to accommodate the large crowd promised and that rates are based on quality of rooms and length of reservation, American plan, makes it quite necessary that you communicate at once with Dr. F. W. Beesley, Republic Building, Denver, stating which hotel you prefer, what price reservations, etc.

Arrangements are being made to entertain the ladies and the children. Several members are making arrangements to bring their families and spend the summer in Colorado.

All interested in the science of orthodontia are invited to attend. In response to the earnest request of a number of nonmember orthodontists, and also general practitioners actively interested in orthodontia, a registration fee will be charged nonmembers. Members of the American Dental Association and the American Medical Association are cordially invited to attend.

Our Golf Committee has made arrangements whereby members arriving in Denver Sunday or early Monday morning may play golf upon some of the beautiful courses near Denver Monday morning, finishing in time to leave upon the 2 o'clock busses for Estes Park. On account of finishing our afternoon sessions early, opportunity will be afforded for the members to play golf upon the natural sod courses in Estes Park, or to engage in horseback riding, mountain climbing or swimming. At the suggestion of the chairman of the Golf Committee, Dr. Archie Brusse, the Denver Open Golf Tournament will be held July 26 to 28, the latter part of the week following our Estes Park meeting. This tournament will be held at the Denver Country Club course. Those desiring to enter should communicate with Dr. Brusse, Republic Building, Denver.

The dates of the Golf Tournament will not conflict with the first three days of the Wild West Show at Cheyenne, Wyoming. Those desiring to see this rodeo, which is considered the best of the kind in this country, may go to Cheyenne the Tuesday morning following the Estes Park meeting, then return to Denver Wednesday evening or Thursday ready to engage in the Golf Tournament Friday afternoon, Saturday afternoon and all day Sunday.

The Burlington Railway has signified its willingness to place several pullmans at the disposal of our members for the Cheyenne trip, these pullmans to be sidetracked in Cheyenne and used in lieu of hotel reservations.

Opportunity to test the skill of the trout fisherman will be afforded by the many streams and lakes in and around Estes Park. One privately owned lake is located four miles from Estes Park Village and is well stocked with rainbow trout. Here members may fish without securing a fishing license, paying the lake owner for the fish caught. One may fish the Big Thompson which flows through Estes Park Village and on down through the wide wild-flower meadows of the park. It is possible to take in a fishing trip after the afternoon session is over and return to one's hotel in time for a late dinner. The proper fishing tackle may be secured in Denver or Estes Park.

One of our Board of Censors ex-members, H. Carlyle Pollock of St. Louis, has a ranch in the southwestern part of Colorado situated on a splendid trout stream and near one of Uncle Sam's forest reservations where the trout fisherman and lover of nature can realize to the fullest extent his heart's desire. Write Teelawuket Ranch, Durango, Colorado, Peter Scott, Mgr., for details.

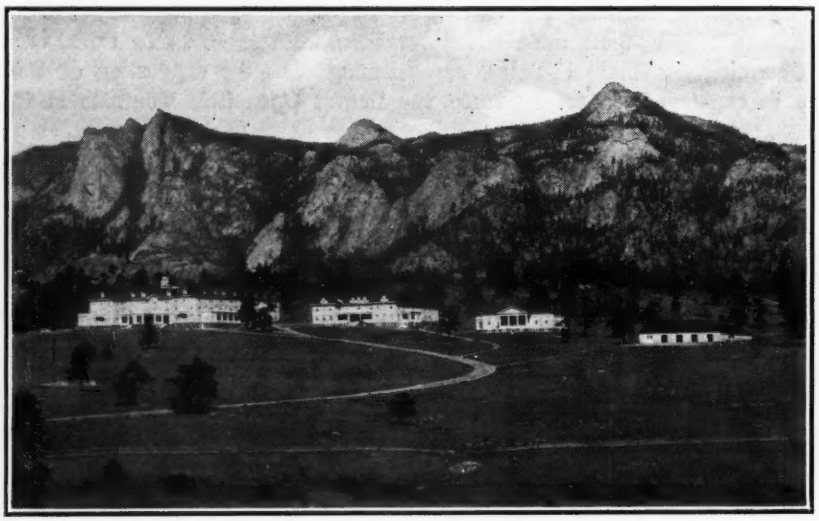
A most interesting and beautiful trip may be enjoyed by returning to Denver from Estes Park on the Rocky Mountain Transportation Company's busses crossing over the Continental Divide at Milner Pass, altitude 11,300 feet, and then on to Grand Lake, stopping there over night, amid wonderful surroundings at the hotels overlooking Grand Lake. Then next day the trip is along the Colorado River into Middle Park and then the Frazer River up near the West Portal of the recently completed six mile Moffat Tunnel, next ascending the Continental Divide from the west over Berthoud Pass and down through historic mining towns, famous in early gold and silver mining activity, and on over the Denver Mountain Parkway System to Denver.

Headquarters to Be Established in Denver as Well as in Estes Park

Local Arrangements Committee to Provide Information Booth in Denver Hotel Headquarters

By Robert L. Gray and Wm. R. Humphrey, Publicity Committee

Inasmuch as the 1929 meeting of the American Society of Orthodontists will be held at Estes Park, which is situated in the Rocky Mountains, and since all members attending the meeting will have to pass through Denver en route, the local arrangements committee thought it advisable to establish a headquarters hotel in Denver as well as at the park. The Committee selected the Cosmopolitan Hotel in Denver, at which hotel they will establish an information bureau for the convenience of the members of our association. We are publishing a cut in this issue of the Journal, as well as a brief description of the headquarters hotels.



Stanley Hotel, Estes Park, Convention Headquarters

The Stanley Hotel, the headquarters hotel for the 1929 meeting of the American Society of Orthodontists, is situated upon a sweeping knoll rising from the Big Thompson River, adjacent to the Estes Park Village. It is located in the center of several thousand acres of the Stanley estates, originally the private game preserve of the Right Honorable Wyndham Thomas, Earl of Dunraven, and without doubt the most beautiful site for a hotel in the Estes Rocky Mountain National Park, famous the world over for its scenic grandeur.

The guest rooms are large and airy and are equipped with comfortable furniture designed to induce rest and relaxation. The large verandas command a view of Long's Peak and its snow-capped companions of Rocky Mountain National Park, the equal of which is not found elsewhere.

The standard of service maintained at the Stanley is that expected and demanded of renowned hostelries. The Stanley is a modern city hotel situated in the primeval beauty of the Rocky Mountains.

The Stanley Hotel has its own convention hall which is in a separate building situated adjacent to the hotel and which more than affords all the requirements for the meeting. The rates are as follows: (American plan)

Rooms with bath or en suite with bath:

$ 9.00	single	$16.00	double
9.00	"	17.00	"
10.00	"	18.00	"
11.00	"	20.00	"
14.00	"	24.00	"

Rooms with running water, convenient to bath:

$6.00	single	$12.00	double
7.00	"	13.00	"
8.00	"	14.00	"

This hotel offers special rates for three or more in a suite and special rates by the week.

Description of the other hotels will appear in the May issue of the JOURNAL.

The Cosmopolitan Hotel, Denver Headquarters for the 1929 meeting of the American Society of Orthodontists is Denver's newest and finest hotel, strictly modern in arrangement and appointments, is something more than the result of architectural genius.

Cosmopolitan Hotel, Denver, Information Headquarters

From the moment of entrance into the charming atmosphere of the main lobby, one senses the liberal hospitality of the West and feels at home.

The same friendly atmosphere, combined with quiet elegance, is found in the matchless beauty of the ballroom; in the feminine appeal of the ladies' lounge; in the artful arrangement of the beautiful mezzanine, in the restaurant (Sunset Room), and in each of the 450 guest rooms, where every convenience and comfort requirement has been provided.

The restaurant (Sunset Room), in the cuisine, service and appointments, is unrivalled anywhere in America. Every need and desire of the guests is met with a quiet and efficient response that is evidence of the most careful selection of a personnel that measures up to the highest standard.

The spacious ball room (Hall of Colorado) accommodates 1,200 dancers. Here on Wednesday and Saturday evenings, the fame of Chief Gonzales and his Cosmopolitan orchestra has made the dinner dances a popular phase of the hotel life and of Denver's social activities. Concert and classical selections add pleasure to dining hours.

It is located on the edge of the best business district, close to capitol and civic center, and overlooking the beautiful residential section of Denver, one block from all car lines yet convenient to shopping and office districts and only five minutes' walk to theaters.

The rates, European plan, are as follows:

Single rooms, with bath, $3.50, $4, and $5.
Double rooms, with bath, $6, $7, and $8.

Round Table Discussion and Luncheon

L. M. Waugh, Chairman

Wednesday, July 17, at 12:30 P. M.

Special arrangements for the luncheon have been made adjacent to the auditorium. During the service each topic leader will discuss his report with members of his group, and at 1:30 P.M. the assembly will convene in the auditorium to hear the reports.

Ten topic leaders, members of the sectional societies, have been selected, and the different parts of the United States and Canada will be represented. The leaders will be privileged to select their own topics or one will be assigned, whichever is preferred. Duplication of topics will be avoided by the Chairman of the Discussions. Benefiting by the experience of the past two years, it is deemed best to have each leader prepare a questionnaire which will be mailed to those in his group and the answers returned by mail sufficiently in time so that a summary with conclusions may be prepared in advance of the meeting. This will be read and discussed at the table and such modifications made as the group may dictate. The report will then be read to the entire body in the auditorium, five minutes being allowed each topic leader. By this means it is hoped to have each report in final form as it is presented and handed in, thereby obviating much correspondence and delay in getting the manuscripts for publication.

The chairman urges prompt cooperation of the members in their correspondence with their respective topic leaders and hopes that the session will be both interesting and instructive.

My Trip to Colorado

By Charles R. Baker, with much assistance by Joe Mills

Upon arrival in Denver, Saturday, last July 14, at about 10 P.M., Bill Flesher and I were met by Dr. and Mrs. Ketcham and other friends who gave us the keys of the city and conducted us to the splendid Cosmopolitan Hotel. The next morning was busily spent at Dr. Ketcham's office, and after a delightful trout luncheon at his home we were taken for a drive around town and then to visit Dr. and Mrs. Henry F. Hoffman who had generously invited us to dine with them at their summer home up in the mountains. This drive was very interesting, and we enjoyed a most pleasant visit with the Hoffmans.

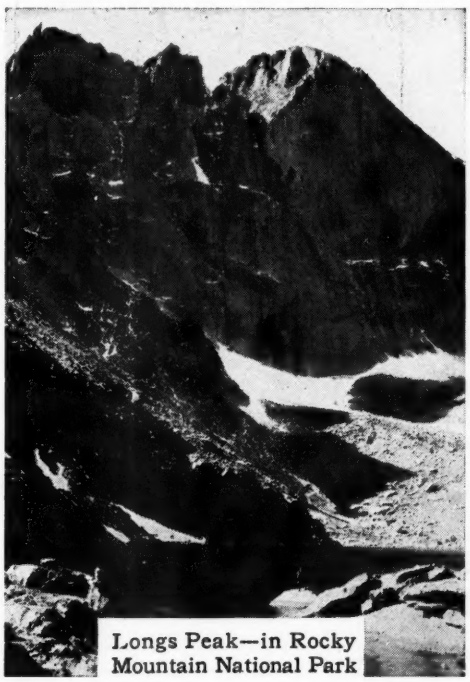
Their attractive cabin in such a delighful location, the wonderful view, and the cordial hospitality of the Hoffmans, combined to make our visit an event that will suggest pleasant memories for long years to come. We drove back to Denver after dark by a different and shorter route, about twenty-two miles, and stopped to visit the last resting place of one of the great pioneers of the west, Buffalo Bill. His grave was illuminated by a spot light which also showed the Star Spangled Banner proudly floating in the breeze. We visited a large museum built of logs, filled with excellent paintings and interesting souvenirs of this man and of other famous characters of earlier days. The drive from this place to Denver was unusual and particularly fascinating to a person from a flat country like Illinois. Below us lay the city of Golden with hundreds of electric lights which sparkled and glistened in the thin, clear, Colorado atmosphere. Ten miles away the lights of Denver offered a fascinating picture. Dr. Ketcham did all the driving, and we kept two spotlights working continuously to locate the winding road and to prevent our rolling down steep places. Dr. Ketcham is an excellent driver and wears two pairs of goggles for day driving. We reached the hotel at a late hour and were told to be ready to take the bus at 7 o'clock the next morning for Estes Park.

At the appointed hour we found that there were ten of us ready to go: Dr. and Mrs. Ketcham, Dr. and Mrs. Chapman, Dr. and Mrs. Ridley, Dr. Eddie Arnold, Dr. B. J. McGinnis, Bill Flesher and your secretary. Our driver was Vic, a splendid young man who is a college student at Boulder. He headed the big red bus for the wide open spaces, and we were on our way to Estes Rocky Mountain National Park.

Our route was to the northwest of Denver with Long's Peak, a mighty landmark, rising into the scarf of clouds that circled its snow-crowned head. We crossed the eastbound streams coming down from the snowy range that cut into the skyline, streams that dwindled

into irrigation canals that in turn watered magnificent crops: alfalfa, sugar beets, berries, orchards, grain crops and melon patches. Of a sudden we turned, headed for the first barrier range of foothills and began climbing a steeper grade. But there was no opening into the mountains, no gateway! Around a turn we found the Big Thompson River pouring over a dam, and besides it a clean-cut road headed upstream between towering cañon walls. After that it was "Ooooh" and "Ahhh" by turns; neck-cricking attempts to see the top of the sheer walls, increasing wonder of the roadway, comfort in the cool spray of the river that roared down to meet us and crowded the road close against the cliffs and shared the limited space in the bottom of the cañon with grudging growls and gurgles. Up and up we climbed, gaining altitude steadily, catching glimpses of big evergreens, of many-hued wild flowers, bright blue sky and purple shadows. Fishermen everywhere along the stream, campers, tents, cottages—it all slid past so rapidly that we could scarcely record the changing items.

We burst out of the cañon into Estes Park—a dream come true. Mighty mountains against the sky, saw-toothed and ragged. Silence fell, for words were inadequate. Spreading meadows of green grass, dotted with evergreen trees, carpets of wild flowers that



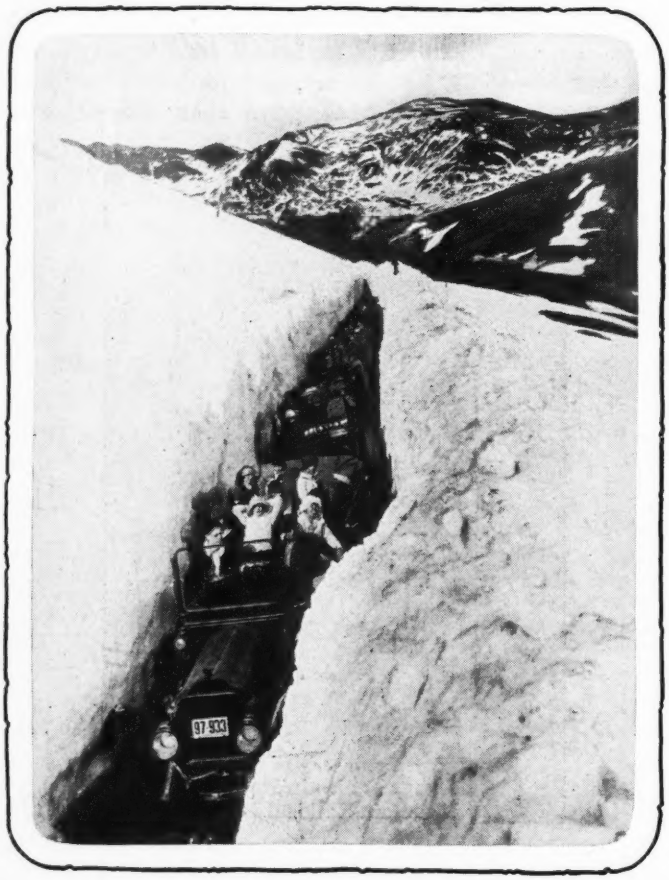
Longs Peak—in Rocky Mountain National Park

painted the landscape, birds of gay plumage, wild animals—deer and elk, the happy hunting ground of the Indians before white men came. Here was high country indeed, higher than we had dreamed. Timberline, vast alpine moorlands with rare flowers. All this a national park—no wonder it is called a playground.

Each turn of the road revealed more wonders, secret cañons, spreading valleys, purple peaks all linked together with wide roadways or threadlike trails for riders. And everywhere we went were smiling, happy people who waved to us, called greetings and went their way.

We drove through the little village of Estes Park and after a hard pull up a steep incline, in low gear, arrived at the Crags. Here we met Joe Mills, the proprietor, a most likeable and interesting man who has lived most of his years in this beautiful country. After a short rest and excellent luncheon (wherein I gained two pounds) we drove to three other hotels, the Stanley, Elkhorn Lodge and the Lewiston. The Casino Building at the Stanley Hotel will meet our requirements very satisfactorily as a meeting place. Next, we visited the chamber of commerce officials and inspected a large auditorium in the village of Estes Park. We had dinner and enjoyed a pleasant evening at the Crags, discussing plans for the coming meeting.

The next morning we journeyed to the top of the Great Divide, to an altitude of about 12,000 feet, above mysterious timberline to alpine heights. Here snow banks refused to vanish beneath the bright sunshine, and glacier ice gleamed. Bighorn mountain sheep looked down at us from the cliffs and we exchanged curious stares. We piled out of our bus and plunged into the snow banks, tested their reality, found them genuine and snowballed—winter sport in the summer time. There was so much to see that was new and strange that reluctantly we went from one thing to another. It seemed that the world was inverted, like the divisor, clouds beneath us, with clear skies above them. Beneath us were deep-cut cañons, timbered mountains of green, while for more than a hundred miles rose range upon range of mountain tops, purple with distance; out across the plains the horizon that rose to our level was dotted with lakes, smudges of smoke that marked towns or trains—half the state



Snow Tunnel in summer, Fall River Road, between Estes Park and Grand Lake

was visible from our lookout post. Scurrying chipmunks darted across our pathway, and curious camp birds followed us with the hope that soon we'd strike camp and divide food with them.

We were sad to think of going home, for we knew that nothing could be as beautiful as what we had seen. But as we motored through the valley at the foot of Long's Peak, with that giant mountain towering a mile above us, we forgot our plan to be disappointed and watched the changing shadows, the snow bank and the sheer cliffs far above. Down the South St. Vrain we dropped, a broad highway along the roaring mountain stream. Beauty everywhere, romance around every corner, we thrilled at unexpected sights, enjoyed the ranks of evergreen forest and emerged from the cañon at last with the feeling that we had really seen the Rockies. Our glimpse at this marvelous high country whetted our desire for more; and when convention time comes next year, we are going to see more of the National Park region, follow some more of the trails, and look into the primitive wilds.

THE PROGRAM

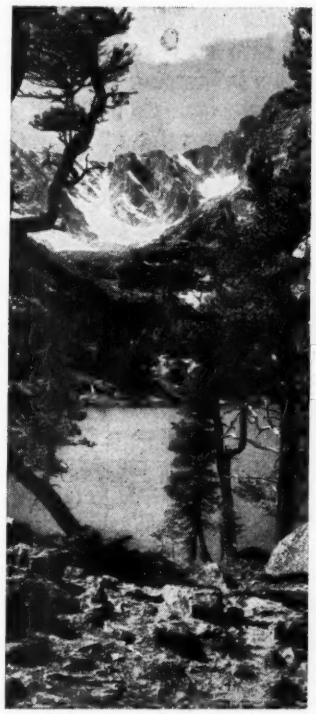
Annual Meeting of the American Society of Orthodontists

Estes Park, Colorado

By William E. Flesher, Chairman, Board of Censors

The scientific program which is being arranged by the Board of Censors of the American Society of Orthodontists should be of unusual interest to every member. Though as yet it is not completed and is subject to change, the following information will indicate some of the subjects which will be discussed.

On Monday evening, July 15, instead of the usual address of welcome and response, Honorable Joe Mills, author and naturalist, widely known in the Rocky Mountain district and especially in the Estes Park region, will give a very interesting talk on *Wild Life in the High Country.* His lecture will be illustrated by autochromes and motion pictures. Monday evening will also give the members an opportunity to, say "Hello Mill," "Howdy John," thereby eliminating some of the time for greetings the following morning at which time the registrations will be made.



Bear Lake, Estes Park

Our scientific program covers a period of four days, beginning Tuesday morning, July 16. We expect, however, to adjourn early each afternoon. This will allow an opportunity for the members to have some time with their families in drives through the mountains during the late afternoon and evening, and for others, golf, fishing, horseback riding, tennis, hiking, swimming, and other sports and agencies of relaxation.

There will be no long papers to weary you. Essayists will present their material in a concise manner and in a limited amount of time. Discussions will be limited in length and will be to the point, so that the program will be presented in a way that one will gain a fund of information in a short period of time.

Following the President's address we are pleased to announce that we will have a

paper by James D. McCoy of Los Angeles, California, *Organizing for Pleasant and Efficient Practice.* Many of us have need of the information which our genial Jim will give.

The importance of the use of muscles as an aid in the treatment of malocclusions is generally accepted but not used in the degree it should be. Homer B. Robinson of Hutchinson, Kansas, has kindly accepted a place on our program and will present something of interest on *Muscle Function, Its Effect on Osseous Development, and Its Relation to Orthodontic Treatment.* This will be amplified by a demonstration and possibly by motion pictures.

Because of the study which has been given to orthodontic education on the Pacific Coast and the interest there manifested, Guy S. Millberry, Professor of Chemistry and Metallurgy and Dean of University of California College of Dentistry, San Francisco, California, will present a paper on *Legal Protection of Educational Standards.* We are anticipating an hour of interest and enlightenment on educational problems that will come from the paper and discussions.

One-half day will be given over to a symposium, in a sense, covering the problems in nutrition. The essayists who will present this symposium are as follows: McKim Marriott, Dean and Professor of Pediatrics, Washington University School of Medicine, and Physician in Chief, St. Louis, Missouri, will give a very practical paper on *Nutrition in Its Relation to Dentition and Bone Growth.* His knowledge and experience in research prepare him especially for his presentation. He is recognized as an authority on nutrition problems and is appearing on many programs at this time.

J. Albert Key, Director of Research Department of Shriners' Hospital for Crippled Children, St. Louis, Missouri, will give us a paper on *Bone Atrophy.* Doctor Key has a thorough understanding of conditions influencing the changes which take place in bone. It will be a very practical paper for orthodontists and will merit a good hearing.

Orthodontists are keenly alive to the value of proper foods in the daily diet. Usually some phase of the nutrition is deficient because of the lack of the proper foods; then again, using the proper foods, the nutrition is deficient because the food itself does not carry the elements it should have. This may be caused through the deficiency in the soils of the necessary elements for normal plant growth. This subject will be discussed.

Every orthodontist will be interested to hear the next paper which will be presented by John Albert Marshall, San Francisco, California. The paper will be *A Report of the Progress of the Research Under the University of California, Orthodontic Grant.* In this report you will learn something of the problems in the research work with the monkeys and some of the results.

On Thursday morning we believe we have a treat to present to the members of our society. The topic involved is *A Symposium on Apparent Distoclusion.* B. E. Lischer of St. Louis, Missouri, will discuss the subject of *Differential Diagnosis and Prognosis of Apparent Distoclusion.* Then C. A. Hawley of Washington, D. C., and Allen H. Suggett of San Francisco, California, will give the treatment of the so-called distoclusion cases. Ample time has been arranged for the discussors. We believe that this will be a very interesting presentation, and that much helpful information will be gained therefrom. No doubt there will be an interesting discussion which, we believe, will clear up some points about the diagnosis and treatment of this class of cases which requires such very careful judgment in diagnosis and treatment. With these three highlights of the orthodontic profession you can rest assured that their presentation will be scholarly and worth hearing.

In the study of the importance of calcium and phosphorus as it affects the growth of the dental apparatus and bone, we are pleased to announce a report by Robert Lewis, Professor of Bio-Chemistry, University of Colorado, College of Medicine, Denver, Colorado, on this subject. In this report he will give an analysis of his findings in orthodontic cases of the relation of calcium and phosphorus in the blood.

W. Walter Wasson, the Child Research Council, University of Colorado, School of Medicine, Denver, Colorado, will give a report of a survey covering a number of years in which he has been taking an x-ray examination of children from birth to several years of age. He takes his first x-ray at birth, or in the first two weeks, than at regular periods from month to month and year to year. This shows the changes in the dental structures and maxillary sinus, as well as the various other systems of the body.

Martin Dewey of New York City has consented to prepare a paper on *The Constancy of Cusp Position as Related to Facial Forms.* In our study of the facial and dental development this subject should have full consideration. We can rest assured that this paper will be of a very high order.

Another paper of a high class for the members of our organization is that to be presented by Milo Hellman. The mention of his name is sufficient; we know that his presentation will be of great merit and well worth our time hearing it.

Leuman M. Waugh will have charge of the round-table discussion this year. That is enough said. Knowing Doctor Waughs' ability to get results, you may look forward to the round-table discussions and to the summaries reported by the chairmen as worth while.

Our case reports and clinics this year are in the charge of Paul G. Spencer of Waco, Texas. He has already the allotted number of case reports which are of high class and will be very practical. He has some interesting clinics, every one of which should be seen. As a special attraction he has some motion pictures of clinics.

Case Reports and Clinics

By P. G. Spencer, Chairman

The case reports and clinics will be of a practical nature. There is also quite a variety of subjects covered in both lists. Each of the case reports will have a discussor which will add to this feature of the program.

The clinics will be presented in a way that will be of an advantage to the clinician as well as to the listener. We are pleased to announce the names of the men who will present the case reports and clinics.

CASE REPORTS

Harold Chapman, London, England
Frank A. Delabarre, Boston, Massachusetts
C. A. Hawley, Washington, D. C.
Henry F. Hoffman, Denver, Colorado
Clinton C. Howard, Atlanta, Georgia
B. E. Lischer, St. Louis, Missouri
W. A. McCarter, Topeka, Kansas
O. A. Oliver, Nashville, Tennessee
Raymond C. Willett, Peoria, Illinois

CLINICS

E. B. Arnold, Houston, Texas
E. A. Bach, Toledo, Ohio
O. W. Brandhorst, St. Louis, Mo.
I. C. Brownlie, Denver, Colorado
H. R. Denbo, Chicago, Ill.
Martin Dewey, New York City, N. Y.
Robert Dunn, San Francisco, California
A. C. Hamm, Denver, Colorado
C. A. Hawley, Washington, D. C.
Russell Irish, Pittsburgh, Pennsylvania
Joe E. Johnson, Louisville, Kentucky
Harry E. Kelsey, Baltimore, Maryland
Victor Lay, Buffalo, New York
B. E. Lischer, St. Louis, Missouri
Lloyd S. Lourie, Chicago, Illinois
H. L. Morehouse, Spokane, Washington
James D. McCoy, Los Angeles, California
Oren A. Oliver, Nashville, Tennessee
H. A. Pullen, Buffalo, New York

S. E. Reisner, New York City, N. Y.
Charles A. Spahn, Newark, New Jersey
H. A. Stryker, Los Angeles, California
Allen H. Suggett, San Francisco, California
H. G. Tanzey, Kansas City, Missouri
John E. Taylor, Los Angeles, California
A. E. Voss, Los Angeles, California
A. Clay Withers, Denver, Colorado
Fred Wolfsohn, San Francisco, California
Other clinics to be added.

Eastern Association of Graduates of the Angle School of Orthodontia

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held at the Vanderbilt Hotel, New York City, on Monday and Tuesday, May 13 and 14, 1929.

An invitation is extended to all interested in orthodontia.—E. Santley Butler, Secretary, 576 Fifth Avenue, New York City.

Ontario Dental Association

The Sixty-Second Convention of the Ontario Dental Association will be held at the King Edward Hotel, Toronto, May 27, 28, 29, and 30, 1929. Members of the American Dental Association and State Societies are cordially invited as guests.

Fred. J. Conboy, Secretary-Treasurer,
East Block, Parliament Bldgs.,
Toronto, Ontario.

Dental Society of the State of New York

Preliminary Program

The Dental Society of the State of New York will hold its sixty-first annual meeting in Rochester, New York, on May 15, 16, 17, 1929.

Literary exercises, clinics, exhibits, etc., will be held at the Columbus Building. Dr. E. G. Link, Cutler Bldg., Rochester, N. Y., is chairman of the Exhibits Committee. Dr. John T. McIntee, Cutler Building, Rochester, N. Y., is chairman of the Clinic Committee.

The Executive Council will convene, for the transaction of the business of the Society, on Tuesday, May 14th at 3 P.M.

Essayists.—Dr. Frederick B. Noyes, Chicago, Illinois; Dr. Chalmer J. Lyons, Ann Arbor, Mich.; Dr. O. G. L. Lewis, Philadelphia, Pa.; Dr. P. C. Lowry, Detroit, Mich.; Dr. T. W. Mavos, Cleveland, Ohio; Dr. James K. Burgess, New York City.

During the time of the meeting, sessions of the New York State Dental Hygienists Association and the Dental Assistants Association will be held.

Headquarters will be at the Hotel Seneca and reservations should be made direct with the hotel management.

For information with reference to the literary exercises, clinics, etc., apply to Dr. A. P. Burkhart, Sec'y, 57 East Genesee St., Auburn, N. Y.